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TANKS IN THE NEXT WAR

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THE NEXT WAR
a series edited by
CAPTAIN LIDDELL HART

Tanks
in the next war
by
MAJOR E. W. SHEPPARD, O.B.E., M.C.

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EDITOR'S PREFACE

MODERN war has too wide an effect for its practice to be treated as a "mystery." Statesmen may direct it ; generals, admirals and air marshals may manage its operations—but every citizen, man or woman, is perforce a shareholder. The more they know about the way it is conducted the better for their security. The aim of this series is primarily to enlighten the intelligent public as to the probabilities of a future war in its various spheres, if it is hoped that the military reader also may find some stimulus to thought, about his problems.

Although twenty years have passed since the last great war ended, it left so deep an imprint that we are apt to overlook the fact that few of the men now under arms, and fewer still of those who might be called on, have any personal acquaintance with war. The natural consequences are to be seen in any of the exercises carried out by the Regular and the Territorial Army during the annual training season. On those battlefields without bullets or shells, many things are done which would be impossible under actual fire—and without their impossibility even being perceived. The unreality is often increased because the situations on which exercises are based have themselves an air of improbability.

The potentialities of mechanised warfare form a subject that is almost as controversial as air warfare. Although the armies have become

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increasingly mechanised, every yard of progress in that direction has been grudgingly conceded by the military authorities. The claims made for the tank by its protagonists have been vehemently disputed by more conservative soldiers, and even to-day the question of its future remains in doubt. If the later stages of the World War saw a striking vindication of the tank pioneers, the more fragmentary evidence obtainable from the latest wars has provided their opponents with some ground for renewed resistance, and even in more impartial judgment has raised a doubt whether the wider prospects of mobile warfare that seemed to be opening are not already being closed by the development of antidotes to the tank.

In these circumstances it is valuable to obtain the view of a professional student of mechanised warfare, who is also an historical scholar. Major E. W. Sheppard had gained first-class honours in the history school at Oxford before he entered the Army, while after the war he was, until his comparatively recent retirement, an officer in the Royal Tank Corps. During the past twenty years he has made a large and important contribution to military literature. While his writings have been essentially progressive in thought, he has moved with a sure tread, avoiding blind leaps and speculative pitfalls. And his capacity for treating military problems is greatly enhanced by his knowledge of other subjects and wider issues which inevitably affect their solution.

CHAPTER I

THE GENESIS OF THE TANK IDEA

THAT the future lies in the womb of the past is as true of the weapon of war known as the tank as of every other human invention or institution. To understand, therefore, what the tank is to-day, and what it may become in the future, it is necessary to take a glance at what it has been in the past. Our glance need be only a brief one, for the past history of the tank is itself but brief.

In war the primary purpose of the soldier is to kill, injure, or incapacitate his adversary, while at the same time avoiding getting killed, injured, or incapacitated himself, and the task of those who equip him for war, send him to war, or lead him in war is to facilitate as far as possible his accomplishment of this twofold task. The problem before the fighting man, therefore, is how to give blows himself and at the same time avoid receiving them—how to hit and yet secure himself against being hit. This problem has in the past been solved in many ways, variable and varying with the circumstances prevailing at the given place and the given moment, but it resolves itself into four sub-problems :

How to strike one's enemy at a distance.

How to move towards him.

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How to strike at close quarters.

How to prevent being struck oneself during the above three processes.

The tank, past, present and future, is a device for solving these sub-problems and therefore the main military problem, not only of its time, but of all time—hitting and security against being hit. But it is by no means the first device of its kind ; it is the heir of a long line of predecessors, more or less—mostly less—successful, dating back to the primæval days of war.

The earliest ancestor of the tank was probably the war chariot, as used by the Assyrians and Syrians and Egyptians in Biblical times, and by the Greeks and Trojans of whom Homer sang. Here we find the warrior armed with bow and arrow and javelin for long range attack, the horse-propelled chariot with its driver to enable him to advance on the foeman and make use of thrusting spear and sword (assisted by the hoofs of the chariot horse and sometimes by cutting scythes in the wheels of the chariot) at close quarters, and the warrior's shield and body armour for protection during the advance and the fight. The war chariot rendered good service for many generations and in many wars ; its weakness lay in the absence of protection for its means of propulsion, the horse, and the frangibility of the of the machine itself. Nevertheless it was for a long time a generally satisfactory solution for the problem.

Another interesting attempt at a solution, adopted first in Eastern warfare, introduced to

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the warriors of the West by Porus in his battle against Alexander the Great on the banks of the Hydaspes, and extensively used by Pyrrhus of Epirus and by the Carthaginians in their duels with Rome, was the employment of squadrons of battle elephants—Dame Nature's tank. It may be noted that the first purpose of these squadrons was a purely defensive one—they were meant only to repel or discourage the onslaught of hostile cavalry whose horses distrusted their aspect and disliked their smell. Later they were employed as an arm of assault, often with astonishing and decisive results, but too often with equally disastrous consequences to those who relied on them. Considered as a tank, the elephant, in fact, had two disadvantages: his armoured protection was insufficient, and his means of propulsion, motivated as these were by his own independent and often uncontrollable animal will, were highly unreliable. He went out of use very quickly once the Roman armies learned how to deal with his onslaughts.

The next manifestation of the tank idea may be said to have come with the advent of the armoured knight of the Middle Ages. This mounted warrior, encased in complete mail or plate impervious to the missile weapons of the time, riding a steed protected only in somewhat less degree than himself, was impregnable and irresistible to all save his like, and for a thousand years ruled the battlefields of Europe. No infantryman could stand up to him in open fight, and battles resolved themselves into duels between bands of these

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mail-clad cavaliers—tank versus tank battles; as one might term them in present-day parlance—in which victory was determined by superiority of discipline and tactics rather than of armament or skill at arms. The weakness of this prototype of the tank was that as he was a shock action warrior only and could not hit at a distance, he could be kept at harmless length by walls or entrenchments, or even upon occasion by natural obstacles. Thus when he encountered, in the Mongol armies which invaded Eastern Europe in the thirteenth century, foes even more mobile than himself, almost as effective for shock action, and also able, accomplished horse-archers as they were, to deliver fire from the saddle while in motion, he fell an easy prey. A hundred years later this essential weakness of his was further exploited by the Swiss infantry, who proved their fitness to contend with him in close-quarter fighting. Later still, new missile weapons were introduced: first, the long bow—the value of which the patriotic instinct of British historians has combined with their ignorance of the military history of other countries to lead them to over-rate—and then the first firearms. These improved missile weapons enabled suitably arrayed and posted infantry to keep the mailed knight at arm's length where he could not use his sword or lance at all; his attempts to regain his invincibility by means of thicker and therefore heavier armour, merely deprived him more and more of an equally useful protection against missile weapons—mobility and power of manœuvre. Finally it

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became clear that complete protection could be given, if at all, only by rendering the knight and his horse so ponderous and clumsy as seriously to diminish their powers of shock action, and then the uncontested battlefield supremacy of the mailed horseman came to an end.

The view is often held that it is only a question of time before every weapon of war invented by man finds its counter. This is true, but, as proved by the history of armoured knights, this process may be an unconscionably long one, and the devising of the appropriate counter and its general recognition and adoption a matter of generations. For a hundred and fifty years after the first appearance of firearms on European battlefields in the middle of the fourteenth century, heavy-armed cavalry were still an essential element of every army worthy of the name; and for close on a hundred years more the respective values of the bow and the firearm as missile weapons were matters of acrimonious debate among the experts. Had the advocates of the former prevailed, the heyday of the armoured knight, already over a thousand years long, might well have been longer still.

Meanwhile there had been occurring an interesting variation of the basic idea of the armoured knight. With the adoption of the firearm as the missile weapon *par excellence* of the future came the idea of making those who used it transportable. This was, in fact, a modern version of the Mongol mounted bowman. Its first and most obvious form of adaptation, however

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the mounted musketeer, was soon found, and has ever since been found, to be of limited value, though for many a year the horse pistoleer exercised a widespread and disastrous influence on cavalry tactics ; and by the beginning of the seventeenth century the mounted arm had reverted to shock action as its primary idea and left missile weapons to its infantry brethren who, already for nearly two hundred years, had been toying with the idea of some sort of battle car which would enable them to fire on the move.

Designs for such machines emanated from all sorts of sources. Leonardo da Vinci, the great Italian artist, for instance, told a friend in 1482 : " I am building secure and covered chariots which are invulnerable, and when they advance with their guns into the midst of their foe, even the largest enemy masses must retreat ; and behind them the infantry can follow in safety, without opposition "—thus showing, as the writer to whom I owe this quotation remarks,¹ that he " had a clearer idea of a tank operation than many a British soldier had prior to the battle of Cambrai, fourteen months after the first tank had taken the field." But at least there was at the time of the battle of Cambrai a fleet of British tanks actually in being, whereas the idea of Leonardo's tank remained, so far as we know, an idea only, so that the much-maligned British soldier of the time could at least be in a position to say, as did the Greek architect ungifted with eloquence, after listening to a long and flowing description of the

¹ Maj.-Gen. J. F. C. Fuller, *Tanks in the Next War*, p. 7.

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plans of his rival in tendering for a public contract, "All that the speaker has described to you, I will execute."

There were many other designs for battle cars before and after Leonardo's time, the earliest dating from about 1400 and the latest from about 1650. Some of them actually appeared on the battlefield. At Ravenna in 1512, thirty cars, each carrying a group of arquebuses, designed by Pedro Navarro, were employed by the army of the Holy League. They were small two-wheeled vehicles, capable of being man-handled, with a spear protruding in front and scythes fitted to the wheels as defences against infantry and cavalry attack, but no attempt appears to have been made to use them save as stationary strong points in the line of defence; indeed, they were probably incapable of movement once the fighting had begun. Therein, in fact, lay the main problem of the battle car—its motive power. Until the invention of the steam engine the only possible methods were by man or by horse power. The limitations of both, alike as regards the size and weight of the car they could propel and the speed and facility with which they could propel it, were far too narrow for any great degree of efficiency. Other devices for more effective propulsion were proposed from time to time; one battle car moved (or more probably failed to move) by means of wind wheels, and another ingenious designer, inspired by the superficially obvious, but actually somewhat misleading analogy between battle car and man-o'-war, constructed a

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full-rigged ship on wheels, with sails, masts and spars complete, heroically oblivious of the effect on the efficiency of his landship of absence of wind, contrariness of wind, and broken country. All was in vain ; until the advent of steam the battle car was not a practical proposition.

In the last third of the eighteenth century, when the steam age may be said to have begun, the idea was revived. In France, one, M. Cugnot, as early as 1769, produced a steam-propelled wagon designed for war purposes ; it seems to have left something to be desired, for its pace was that of a man walking slowly, and it could go only for twenty minutes at a time, after which it had to wait for a quarter of an hour to get up steam again ; and its steering was so unreliable that at its first public trial it got itself entangled with part of a brick wall and landed its inventor, who, owing to the impecuniosity which is the badge of his tribe, was unable to pay for the damage, in the public gaol. Nothing more was ever heard of his war machine ; but it was the ancestor of a large progeny of traction engines of various types and breeds, all designed primarily for road work in peace, but quite capable, one would think, of being adapted to war purposes—only, as it happened, nobody seems to have thought of it.

Possibly the fairly obvious fact that no sort of battle steam car could have aught but a closely confined sphere of utility, so long as it was unable to move off roads or tracks, may have tended to discourage the ingenious-minded from devoting

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their attention to the problem. But it was not long before cross-country movement became possible, thanks to various devices designed to replace the heavily-weighted wheels and thus distribute the load of vehicle and cargo more evenly. The most efficient of these took the form of a series of planks attached to the wheels, which came down to the ground in succession as the wheels revolved and so formed a sort of endless track for them to rest on. The tracks of all military tanks from their first appearance in 1916 to the present time are still designed on this same principle.

By 1890, the tracked vehicle, in place of a series of short spans fixed to the wheels, had an endless chain encircling all the wheels so as to form a continuous track. In one model this track was doubled so as to form an inner and an outer belt, to allow for a certain amount of springing and lessen the shock caused by the passage of obstacles or inequalities of ground. The old problem of means of propulsion, however, still continued to exist; steam vehicles were unreliable, laborious and conspicuous, and not till the advent of the internal combustion engine at the end of the nineteenth century was it at last with sight of solution.

Between the years 1900 and 1914, there were many designs put forward and many experimental vehicles constructed from which a satisfactory tank might well have been evolved. Indeed, more than one was, in fact, evolved; the design and specifications were submitted to the War

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Office and duly pigeon-holed, only to be rediscovered after the Great War had long since ended. Soldiers usually manage to find more pleasant, if hardly more profitable, employment for their hours of work and leisure than keeping abreast of the highly specialised worlds of science and mechanics. Those under whose offended eyes the project of this military monstrosity was placed assuredly thought as little of it as they understood about it; their reactions to it must have been much the same as those of the Navy to the first proposal to replace the wooden walls by steam ironclads—" 'Tis a consummation devoutly not to be wished." So the first peacetime designs for a tank were stillborn; they were not alone in that misfortune, for others—produced not in the piping times of peace but amid the terror and perplexities of the first months of the World War—were to meet with no better fate. As we look back on this from the cloud-capped towers of our *ex post facto* wisdom, such shortsightedness seems as culpable as incomprehensible. So to judge, perhaps, is neither charitable nor profound. No man whose duty it has ever been to plough his way through some few of the myriad designs produced by human ingenuity, or insanity, for the improvement of the world and all that therein is, can feel sure that he has never had before him anything but waste paper and midsummer madness. But unless the official who surveyed these things on behalf of the pre-war British Army was more fortunate than most of his successors, he may well, by the time he reached

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the tank project, have been both over-worked and disillusioned. Anyhow, the design was duly pigeon-holed and lost in oblivion, and the world had to wait for the first modern war tank till the World War came.

CHAPTER II

THE COMING OF THE TANK

AT the outbreak of the Great War in 1914, therefore, there was no such machine as a battle car in existence; yet all the elements in its composition were ready to the hand of designers, and the age-old problems of how to strike at a distance, move forward on the enemy, strike at close quarters and secure protection during these three processes were fully capable of solution by mechanical means. Men, guns and machine-guns with their ammunition, tracks for cross-country movement and armour to ward off hostile projectiles could now all be borne in one vehicle, having the internal combustion petrol engine as its means of propulsion. The machine had only to be imagined, designed and manufactured, and then—the last and as it proved the longest and most difficult stage of all—to prove its worth in action.

As is usually the case with any noteworthy invention, several different people appear to have thought of the tank at or about the same time, and when, after the war, an official committee sat to apportion the credit between them, it had considerable difficulty in coming to a decision, and as much in getting that decision accepted by the

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contesting claimants. But it is safe to say that if one of these people had not been Colonel E. D. Swinton, in October, 1914, an official correspondent with the British Expeditionary Force in France, and later secretary of the Government War Committee in London, the tank would never have come into being at all in time to prove itself in the later stages of the Great War. On October 20th, 1914, Colonel Swinton first put forward his idea to the Government, and it is some measure of the difficulties that even able, persuasive and influential people meet with in getting the best ideas accepted by Governments, that it was nearly a year and a half before the first tank worthy of the name saw the light of day and nearly two years before it first appeared on the battlefield. But for him the new idea would have been stillborn; and to him more than to any other man can the honourable title of "father of the tank" be said to belong.

Colonel Swinton's first project met with favour then in the eyes neither of the War Office nor of G.H.Q. in France, yet his memorandum proposing it outlined in an astonishingly prophetic way and with almost uncanny accuracy not only the basic principles of design of the machine, which were afterwards found by experiment to be the best and were actually adopted, but also the methods of its use. These too were in due course adopted, but only, alas! after a series of costly trial-and-error experiments—costly not only in time and money, but in that most precious commodity of all, human lives—and after a sacrifice of the

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surprise value which is always the primary asset of any new weapon.

Indeed, but for the energy and vision of Colonel Swinton and in a less degree of Mr. Winston Churchill, then First Lord of the Admiralty, the tank idea must have died in the womb. Colonel Swinton brought the first tanks to birth, raised and trained the personnel to man them and outlined with uncannily accurate prescience the correct principles of their use, Mr. Churchill seconded his efforts by forming an Admiralty experimental body to study and develop its possibilities, and thus the Navy, which half a century earlier had itself gone through an equally painful transmogrification from old to new machinery, came to act as midwife to its more backward sister service in the same process—and paid its own expenses. But the process of gestation was a long and wearisome one. It was not till February 2nd, 1916, that the first full-sized working model machine, constructed according to approved design for its specific purpose, passed its trials with flying colours. The new model battle car of the twentieth century was at last born, but with all its teething troubles and childish ailments still before it.

Dimly at the time of its conception, and clearly and urgently by the date of its birth, the problem to which it was hoped the tank would be the answer had been outlined.

This was the problem of the continuous fortified front.

At the outbreak of the Great War all those

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concerned—save a few unheeded voices crying in the wilderness—expected it to be bloody, possibly, but certainly brisk and brief. Everybody was completely wrong. The contending armies in the West, hurling themselves valorously upon each other, after some violent and breath-taking swayings, rocked to a standstill well inside French territory with an open flank towards the North Sea. With equal velocity each side, striving vainly to overlap its adversary, extended across the gap, and after a spell of rending and tearing at each other found themselves front to front from the neutral Swiss frontier to the coast of all but conquered Belgium. The drear winter of 1914 closed down on the two belligerent hosts, Allied and German, bled white, shattered and exhausted, intent only for the moment on holding what they had. Both set to work to dig and put up wire and fortify, and all along their fronts there developed a state of siege on a scale hitherto unprecedented in history.

The effect of this stabilisation and fortification of the battle line on both sides was to render its breach impossible by any methods or means then available. Impassable jungles of barbed wire, massed machine-guns backed by vigilant and powerful artillery, the whole surveyed by the watchful eyes of the air—in the net of these defences flesh and blood could only entangle itself and fall and die, and this the heroic soldiery on both sides did, time and time again, in those grim battles of the winter and spring of 1914-1915, over which, though they cost casualties running

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into hundreds and thousands, history has drawn a merciful veil. Other means to victory had to be sought.

The most obvious way seemed to be to take a leaf from the book of siege warfare and blow a breach in the enemy defences by means of massed batteries and mines, and the earliest attempts at this procedure, though without real results commensurate with the heavy sacrifices incurred, were successful enough to encourage persistence in it. But the road turned out to be a dead end, for the problem only superficially resembled that of the siege of a fortress. The garrison was as strong in fighting power, if not always in numbers, as the besiegers, and the defence to be overcome was not a wall that could be breached, but a net that had to be cut through mesh by mesh—and by the time this toilsome and lengthy process had been completed there were more men and more defences ready beyond. Often, too, these rear lines were out of range of the attacking artillery as sited for the first stages of the assault, and no impression could be made until the guns had moved forward—which meant more leisure for the enemy to strengthen himself. In the end the defence always out-fought and outlasted the attack and brought it to a stand before it could effect the ever-dreamed-of but ever-elusive break-through. Yet hope sprang eternal in the breasts of the commanders on both sides; they believed they knew the answer to the problem, though as yet they had it not. More men, more guns, more ammunition—in these lay the means of victory, if

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the nations behind the armies would only provide them in sufficient quantity. But the more men were supplied, the higher the tale of losses mounted, and the more mediocre grew the quality of the replacements. The denser the serried array of guns, and the more earth-shaking and destructive the torrents of shell poured upon the enemy, the more riven and impassable became the ground over which the infantry had to advance to the storm, and the guns themselves had to move up to new positions when the first attack had floundered and tottered to a standstill. Even while the tank was coming to birth, it was more than doubtful, alike to the soldiers who had to fight these dreadful battles and to the statesmen who had to furnish the means for them, whether, despite the confidence, real or assumed, of the generals, victory really lay along that road. It seemed sufficiently doubtful at least to justify the sedition for an alternative one should the road prove to be a *cul de sac* after all.

The Germans were the first to explore new ground. In April, 1915, while the tank project was still in an academic stage, they used poison gas at Ypres in an avowedly experimental attack on a small scale. Their faith in it seems to have been small and their preparations to exploit any success quite inadequate. Nothing more was achieved than to manifest to the Allies the perils and the possibilities of the new weapon, which, as it happened, turned out in the long run to be considerably more effective in their own hands than in those of its inventors. But the limitations

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inherent in gas deprived it of decisive value save as a surprise weapon; as such the Germans had failed to appreciate and utilise it, and to neither them nor to their foes did the opportunity recur.

Yet the Allies' counter-surprise—the tank—as we shall see, was misused in just the same way and all but—indeed, ought to have—suffered the same fate.

Towards the end of the summer of 1916 the new weapon was in being. The first model battle car had been designed, manufactured, and issued; new men, formed in new units, were being trained to use it; and, most important of all in the case of a new weapon, complete secrecy as to its existence had been carefully sought and effectively preserved.

This "Tank Mark I" to give it the official title, adopted originally for purposes of concealment, and since become general, was a curious affair, with a contour rather like that of an ill-shaped diamond. Two all-round tracks enabled it to cross over rough country and trenches; its great weight served to crush wire, guns, machine-guns and men, and smash down trees and buildings and obstacles; its speed, slow as it was, was as fast as that of the infantryman it was designed to accompany and help; and the light guns and machine-guns which formed its armament rendered it formidable to any foe, as its armour made it impenetrable to ordinary bullets. Elementary, clumsy, defective in many a respect, it was yet a novel, terrifying and potent engine of war. Had we been content to wait until we had

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provided ourselves with a really large tank force, manned by well-trained personnel, with ample reserves of men and material to back it up, a great and perhaps a decisive victory might have been won by its aid.

That policy, against which, indeed, there were admittedly, even from the point of view of the Tank Corps itself, weighty considerations to be urged, was not followed. Indeed, given the circumstances and the mentality of those with whom lay the decision in the matter, it would have been too much perhaps even to hope, and certainly to expect, that it should have been.

By the end of August, 1916, the first great offensive by the new British Armies on the Somme had been pressed for two months with little success and enormous casualties, and it was clear that if any results proportionate, even in appearance, to the stupendous efforts of power and expenditure of lives were to be achieved before the coming of winter put an enforced closure to the battle, there was little time to be lost. Some fifty tanks were ready for use; the British Commander-in-Chief had no very great faith in their powers—how should he have had in so novel and untried a weapon?—but they might serve to speed up the British advance. He decided to use them as an auxiliary arm in the next great thrust.

On September 15th, 1916, the date of their first appearance on the stage of the Great War, the tanks, instead of being held back in strictest secrecy till they could be used in masses in one

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great combined operation, were sent forward 'in dribblets on a wide front. The ground for their attack, instead of being specially chosen to comply with their fully-known limitations, was totally unsuited to them. The time allowed for necessary preliminary preparations, such as reconnaissance of ground, marking of routes, and provision for crossings over our own trenches, was totally inadequate for all that had to be done. Neither the tank crews, nor the infantry and artillery with whom they were to work, had ever had time or opportunity to organise and practise mutual co-operation.

The result of the operations was in sum a disappointing failure. Only a third of the tanks ever got forward over our trenches, and more than half of these were put out of action before the day ended. Ten days later the handful of survivors were used again; one acquitted itself brilliantly; the rest did little or nothing. The Tank Corps had only one more battle day in the Somme, right at the end of the fighting in mid-November, when foul conditions of weather and ground inevitably rendered its action ineffective. Then the winter pause set in and the great secret had been given away to no purpose whatever.

Should a different policy have been adopted? In the light of our *ex post facto* wisdom—that harsh light of which every critic and historian should be, but is not always, aware—it is easy, indeed inevitable, to answer, Yes. But it may in fact be very reasonably argued that the policy of holding back the tanks till they could be used in mass in

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1917—which would have been the only possible alternative to using them in driblets in the autumn of 1916—was in fact not a possible one, given things as they were. It would in fact have meant to surrender the possibility of present slight advantage for the remote chance of greater future gain—a gamble on highly irregular and unorthodox lines. To the idea of such a gamble the cautious, direct-thinking, self-reliant, balanced mind of Sir Douglas Haig was entirely un-receptive; if he ever seriously entertained it—there is no evidence that he ever did—he must surely have put it sternly from him as he would have done a mortal sin. A Sherman almost certainly, a Marlborough probably, a Napoleon possibly, might have seen and seized the chance; but not a Wellington, nor a Lee, and a Haig least of all men—and generals, whether great or less great, are but mortal men, as are we all, and have the defects of their God-given qualities. Haig was not fashioned from gamblers' clay, nor, perhaps, had he been, would he have held or deserved his high place. So the rude yet precious weapon that was the first tank was drawn prematurely from its sheath and untimely revealed to a world at war.

Fortunately military orthodoxy was not confined to one side only of the still unbroken battle front in the West. German generals too had heard and seen what the tank had done—or rather had not done—and they thought of it just what Sir Douglas Haig thought of it—nothing, or at any rate mighty little. In the seven months that elapsed

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between the close of the campaigning season of 1916 and the opening of that of 1917, no steps were taken by them even to devise a counter to the new weapon, much less to copy it. So the British Army, totally undeservedly, was given a second chance with its tanks—of which it made no better use, unfortunately, than of the first.

CHAPTER III

THROUGH BLOOD AND MUD

DURING the winter of 1916-1917 the Tank Corps in France was re-organised as a brigade and a good deal of study was devoted to questions of tactics and training. But there was no attempt made to provide a new type of tank, though the Mark I tank was not proof against armour-piercing bullets which it was expected that the Germans would use as soon as the campaigning season re-opened, and had serious defects of steering and control which could easily have been remedied in any improved model. But the War Office and British G.H.Q. in France could not make up their minds whether they wanted a new and more formidable type of tank altogether, or whether the existing machines, slightly modified, would serve for the 1917 battles. Their hesitation was disastrous, for before they had finished their discussions, the matter had been decided for them by the inexorable argument of events, and it was too late to re-arm the Tank Corps with new tanks. This was a serious blunder, for an excellent model, later issued as the Mark V, with steering that could be handled by one man instead of needing three as did its predecessors, and in other respects a great advance on these, had been

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designed and could easily have been produced in large numbers by the spring of 1917. But the tank at the time was under a cloud, and G.H.Q. seemed little interested in the development of a weapon that had hitherto disappointed expectations. The numbers of tanks already ordered were drastically reduced, and it was decided that those taking part in the 1917 campaign should be used, not *en masse* to lead a surprise attack on a wide front, but once more by dribblets to assist the infantry, as on the Somme in the year before.

Sixty old Mark I machines of the Tank Corps were first put into action at the battle of Arras in April. As was only to be expected, the Germans used armour-piercing ammunition, against which they were hopelessly vulnerable, and the losses of their unfortunate crews were heavy. There occurred one serious fiasco at Bullecourt, where a dozen tanks were detailed to assist an attack by Australian Corps. The Australians expressed themselves freely and forcibly about the infernal machines and everything and everyone connected with them, and it was over a year before they could be persuaded to have anything to do with them again.

The experiences of other formations in the ensuing summer may well have led them to agree with the Australian point of view. In the highly successful little victory of Messines seventy new Mark IV tanks, with thicker armour to keep out armour-piercing bullets, rendered some useful assistance here and there, but their rôle was only a minor one. Then at the end of July began

the tragic battle, which, under the name of Passchendaele, has ever since been a byword for misery and horror above any other of the Great War. For the officers and men of the Tank Corps, already disappointed with their repeated failures to achieve that of which they knew themselves to be capable, given a fair field and no disfavour, it was an even greater tragedy than for most. Not only had the British High Command decided to batter their way up the glaxis of Passchendaele by sheer brute force of men and shells; not only was this purpose persisted in, despite the breaking of the weather and the conversion of the ground on which our men lived and over which they had to move into an ocean of loathsome and impassable slime; but the tanks and their crews too were flung into this quagmire, in which the Tank Corps staff had from the first declared that they could do nothing and would merely sink and be lost. The High Command, though they carefully husbanded their precious and almost useless cavalry for an opportunity that never came, were deaf to these protests, and the Passchendaele battlefield became a graveyard of half-submerged derelict tanks, inextricably bogged in shell-holes and swamps—pathetic symbols of wasted money, lives, and opportunities. On the first day of the battle, of the 216 tanks that went forward, few came within striking distance of the enemy, and fewer still came back. “The authorities,” says a caustic commentator, “had apparently failed to realise that in this area tanks were as much out of

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place as gunboats would have been." But, unperturbed by this first failure, the High Command used the machines again and again, in smaller and ever smaller packets, to support the successive partial attacks into which the battle had now degenerated. In all these actions the tank crews showed patience, endurance, and stubborn gallantry, but only in a few instances did any modicum of success reward their efforts. Not till October, however, could the Tank Corps staff at last convince their superiors of what to themselves had been obvious even before the offensive began—that the Ypres salient was no place for tanks.

General Elles, the able young Tank Corps commander, and his assistants had ideas of their own for their future use, but for some agonising weeks it was more than doubtful not only whether they could make these ideas prevail, but whether there would be any tanks at all left to use anywhere for any purpose. The fate of the weapon which, in little over a year, was to play a preponderating part in winning the war in the West, was now, in this mournful autumn of disillusionment, trembling in the balance. It had a myriad foes. The War Office was ignorant of the tank's potentialities and fiercely resentful of the Tank Corps' demands for men, money and labour, when all three were daily getting harder to come by. The High Command in France had never had more than a lukewarm faith in these unorthodox contraptions, and had lost what little they had once had. The generals had long since ceased to place any

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reliance on them, and found in their frequent failures an easy excuse for their own. The troops remembered only too well the sight they had all seen of scores of abandoned machines lying helplessly in the mud of the fatal Salient and that memory obliterated any recollection of the tank's few successes. Worst of all, the officers and men of the Corps themselves had inevitably lost something of their early keenness and self-confidence, and there were visible among them symptoms of a decline of morale.

Few, even among the Tank Corps staff, were surprised—perhaps few, save among the Tank Corps staff, were greatly perturbed—to hear in mid-October that the programme of 4,000 tanks to be constructed for the 1918 campaign had been cut down by two-thirds, and that the complete break-up of the Corps and the entire abandonment of mechanised warfare was in serious contemplation.

Recent events elsewhere than on the British front in France had tended powerfully to confirm the doubters in their little faith in the tank.

Almost a year after the generic idea of the British battle car was born in the mind of Colonel Swinton, a French artillery officer, Colonel Estienne, had a similar brainwave. But the French military authorities, their minds doubtless sharpened by the thought of the Germans entrenched immovably on the sacred soil of their country, moved in the matter somewhat more expeditiously than ours—though still without undignified haste—and soon after the conclusion

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of the battle of the Somme the first batch of new French tanks began to make their appearance.

There were two brands of them—a top-heavy, medium-sized machine known as the Schneider, and a heavier, powerfully-armed, but even clumsier vehicle, the St. Chamond. Both were slow-moving, with poor obstacle-crossing capacity, and were to develop under the stress of action serious defects which proved fatal to many of them and to the devoted crews that manned them.

The first Schneider tanks went into battle during the so-called “Nivelle” offensive against the German positions on the Chemin des Dames between Reims and Soissons in April, 1917, and a most unhappy début it proved. Their armour proved a totally inadequate protection against the armour-piercing bullets with which the enemy, warned by the advent of British tanks on the Somme six months before, were now fully equipped. Particularly fatal was the exposed position of the fuel tanks, and even more so the fact that, owing to the limited capacity of these, many machines went into action carrying a reserve petrol supply in tins on their roofs. Within a very few minutes of the commencement of the attack, which the Germans had been amply warned of and were fully prepared to meet, those of the 132 machines (and the proportion was not high) that managed to get forward at all became targets for a deadly artillery fire at most effective range. Many of them caught fire and flamed to heaven, roasting to death those in them; the

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following infantry, who had received no training in co-operating with tanks, tended to keep well away from them out of danger, and by the end of the day two-thirds of the machines of the French Tank Corps lay crippled or burnt out on the field, having achieved nothing with so great a sacrifice. A second attack in the same area a few days later, in which the heavy St. Chamond machines appeared for the first time, was less costly but little more successful; at certain points the tanks did useful work, but the general opinion was that they were unreliable, dangerous, and ineffective. This view must have undergone some revision when, in October, at the carefully staged offensive on the Ailette, 92 tanks of both brands, which had undergone a thorough course of training in close conjunction with the infantry they were to support, did excellently whenever ground and conditions enabled them to show their full capabilities. Here again, however, a large proportion failed to get into action; losses certainly were surprisingly small, but the most that any French soldier, general or private, would have been prepared to admit at this time would probably have been that under favourable circumstances, none too often to be expected, the tank might be able to give some useful help to the older and more important arms. There was nothing in the experiences of our Allies to counteract, and a good deal to support, the unfavourable verdict on the new weapon almost universal throughout the British Army in the autumn of 1917.

By this time, too, there must have been available

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full reports from Palestine, where a tank detachment of eight old Mark I machines had been sent to General Murray's army before Gaza and had fought there in the April battles. Here too the same story had to be told ; only a few of the tanks had ever got as far as the enemy front line and had there done useful but in no way outstanding service. At the third battle of Gaza in November too much had been expected of them—far too much according to later ideas—and they had again disappointed expectations. Here was more support for the opinion that “ the tank was a wash-out.”

Within three weeks of this last disappointment in far-off Palestine, the tank had amazingly and triumphantly justified the most extravagant claims of its most fervent champions.

CHAPTER IV

TO THE GREEN FIELDS BEYOND¹

¹ The title of this chapter, combined with that of the previous one, is a popular slogan, serving as an interpretation of the Royal Tank Corps colours—red (blood), brown (mud), green (green fields).

THE battle of Cambrai, which took place in the fourth week in November, 1917, formed a landmark in the history of war. Heralding as it did the advent of a new weapon, of new tactics and of new possibilities, it was an epoch-making battle if ever there was one. Yet the battle was not fought as the Tank Corps staff desired and planned; the whole tactical conduct of the operations was extremely faulty and, so far from ending in a victory, we lost before the end of the month practically all that we had gained in the first rush of success and only narrowly escaped a disastrous defeat. The battle was important because, and only because, it proved completely and conclusively the value of the tank which, despised and rejected as it had been hitherto, suddenly rose to fame and was within a year to furnish the Allies with a master key to victory. This general though belated realisation of the tank's possibilities, suddenly revealed to friend and foe alike, heralded a new age of mechanised warfare of which even to-day we stand only on the threshold.

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The story of the battle cannot be told here in full. It begins with the formulation at Tank Corps Headquarters of a large scale "tip and run" raid by a heavy force of tanks, as a diversion to the battle then raging in the Ypres salient. The idea was for the tanks to storm over to the hostile lines and get back after a few hours' stay, having done all the damage they could wreak and bringing back with them anything they could collar during that time. A suitable sector south of Cambrai was suggested, where the going was good and two canals on either side of the objective would secure the raiding force from being struck sidelong and cut off. General Byng, the Commander of the Third Army holding that part of the front, adopted the idea with enthusiasm, and his warm advocacy of it successfully overcame the doubts and hesitations of Sir D. Haig. But during their discussions the original project of a great raid was transformed into a plan for a considerable offensive, for which the ground was quite unsuited and the available force inadequate. The auspices for success were hardly favourable, but at least the battle might give the tanks their long desired chance of proving their value when employed on what their advocates had asserted from the first to be true principles.

The battle, which opened before dawn on November 20th, 1917, was an instant and amazing success for the Tank Corps. Three hundred and seventy-eight fighting tanks had been secretly assembled on the front to be attacked without the Germans suspecting in the least what was about

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to happen, and the infantry of two corps, with the Cavalry Corps, were ready to follow them into and through the enemy lines. The supporting artillery in full strength, thanks to recently introduced methods, were in position to open effective fire at the moment of the assault and without warning the Germans, as had always been inevitable hitherto, by registering shots beforehand. Everything possible had been thought of and done to surprise and overwhelm the enemy, and surprised and overwhelmed they were indeed.

Before noon on that battle morning a complete and shattering success had been achieved. Almost everywhere the flood of tanks had submerged defences and defenders ; forests of wire, trenches, specially designed to be impassable by tanks, anti-tank rifles and field guns—all had failed to check their triumphal march. Losses, both in men and in machines, had been trifling, and the main trouble of the infantry had been to keep up with the tanks as they forged steadily ahead into the open and as yet unspoiled country beyond the once formidable hostile lines. Only at one point an obstinate divisional commander's adherence to unsuitable attack methods had caused the infantry to lose touch with the tanks, and so led to both being checked with loss ; but the fortuitous arrival of a reserve division enabled the enemy hurriedly to stuff the yawning hole in their line in time to prevent the Cavalry Corps pouring through it in pursuit. These two mishaps robbed us of decisive success, for we had not the means to batter our way through the gap once

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our first rush had lost its momentum ; the infantry were battle weary, the cavalry had lost their best and indeed only chance on the first day, and the tanks, having been all thrown in without reserves, were a dwindling force. The battle degenerated into a ding-dong wrestle for the ground we had gained in the first rush while the Germans were still staggering from surprise and shock, and it died away after a week with no more achieved, or possible of achievement. A few days later the enemy turned the tables on us and in a well-executed counterstroke shore away half our gains of ground and a good haul of trophies into the bargain. By that time the bulk of the Tank Corps, brought to a standstill in a series of attacks with ever-weakening support against ever-stiffening enemy resistance, had gone back to refit and recuperate, and the battle-worn infantry, thinly spread out over a long front which they were too tired to fortify, were caught napping and overwhelmed. The battle thus ended with honours easy.

Yet one thing had been achieved by it. The Tank Corps had vindicated itself. Tanks, used as their advocates had from the first said they should be used—and had continued to say for fifteen months in vain—had enabled us to conquer in twelve hours, at the price of a mere 5,000 casualties, an area of ground equal to that which at Ypres had cost us three months and a quarter of a million men, and by this startling feat of arms had proved themselves indispensable, if hardly as yet invincible. Cambrai had paid, and more

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than paid, for the waste of the Somme, the disaster of Bullecourt and the miseries of Passchendaele.

Yet this day of glory for the Tank Corps was followed by a long period of anxiety and disappointment. The battle of Cambrai marked the close of the campaign of 1917, and during the following winter the German armies, relieved of their responsibilities in the East by the complete collapse of Russia, concentrated the flower of their troops in the West for a decisive blow against the Allies before the Americans could come in force to their aid. The heavy British losses of the 1917 battles had not been made up, and it was highly doubtful whether we had enough troops to meet the crisis. G.H.Q. decided to distribute the battalions of the Tank Corps, now increased to thirteen, behind the front where the attack was expected, so as to use them to counterattack in the event of the enemy getting a footing anywhere within our defences.

When the great German offensive opened on March 21st, this policy, known irreverently as "savage rabbit tactics," met with occasional success here and there, but only at a heavy cost. The machines, which only did about a mile to five gallons of petrol, could not be kept supplied for long, and many, with their fuel tanks dry and no means of refilling them, had to be left to fall into enemy hands, as had many others which were too badly damaged in action to be moved and could not be repaired in time to be got away. Within a week of the opening of the battle, 120 tanks—60% of those engaged in the action—had

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been lost, though their crews, formed into temporary machine-gun units, continued to do good service in the line. At last, at the very gates of Amiens, the German attack petered out, having brought the Allies nearer to decisive defeat than at any time in the War.

The next great German attack took place in Flanders, but, on April 24th, in a minor action to the east of Amiens, there appeared in the field for the first time a small force of German tanks. They were ungainly, lumbering machines, fairly fast on good ground, but slow and clumsy across country or over obstacles, with heavy but ill-jointed armour. But the sight of them proved just as nerve-shaking to our troops as had that of our machines to the Germans, and only the opportune arrival of a squadron of our own tanks prevented a minor disaster. A tank versus tank duel ensued, the first and last of its kind in the War; both sides had machines hit and put out of action, but the Germans got the worst of it and were finally driven off.

On the same day our new pattern medium tank known as the "Medium A" (of which more later) made a brilliant little début. Seven of them, reconnoitring forward, ran into four enemy battalions forming up for attack and completely routed and dispersed them, inflicting 500 casualties. Never before had the helplessness of unprotected infantry against machines been so strikingly shown, for these 3,000 odd men in the open had no chance against our 21 behind armour and suffered demoralising losses without being able to inflict a single one in return.

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After the German offensive in Flanders had also ended in failure, there ensued a spell of quiet on the British front and the Tank Corps settled down to a busy period of re-organisation and preparation for new battles. After considerable discussion—for there were still critics and doubters in high and influential places—it was agreed that by 1919 the size of the Corps should be more than doubled—from 15 to 34 battalions—and that all units should be armed with the new machines now fast being delivered.

These new machines consisted of a heavy tank, the Mark V, a much improved model over the old patterns, proof against anything less than a direct hit from a shell, with one man control and fully engined up to its weight; and of a new medium tank (the "Medium A," which we have already seen at its deadly work), a lighter, faster and hardier vehicle, with a wide radius of action altogether, manned by only three men, but somewhat difficult for its driver to handle owing to the complicated nature of its internal workings. It was with these tanks that the Corps fought throughout the remaining few months of the War, for though right up to the end improved models of both types were being designed and produced, none of them reached France before the signing of the Armistice in November, 1918.

Meanwhile the French, starting on a new line on their own, had invented and adopted yet a third type, the light tank. These little machines, the famous Renaults, weighed a mere 6 tons, had a crew of two, and carried one machine-gun in a

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small revolving turret. Their obstacle and crossing capacity was small—too small for our ideas—but they were designed not for trench warfare but for fighting in the open country after the enemy trench lines had been breached, and it was proposed to use them in very large numbers and send them forward at full speed to swamp the enemy rather than smash them. But, curiously enough, the first chances to use the Renaults, came, not when the hostile lines had been broken, but because the Germans themselves had broken through the French lines and had established themselves, by the time their progress was checked, in open country where these little mosquito-like machines could operate unhindered by trenches and obstacles.

The Renaults made their début in mid-June when the Germans, following up their highly successful third offensive of the year in which they had driven the French back from the Aisne to the Marne, attacked once more in the area west of the Oise. Here, however, the French were more ready for them, and the little tanks were vigorously used in a series of counter-strokes which in the end, though at considerable cost, brought the assailants to a standstill with comparatively little to show for their efforts. The Renaults, highly tried in this their first battle, did well. "Engaged by small fractions supporting such small infantry units that they were often too weak to hold the ground after it had been taken by the tanks," writes a French officer who took part in it, "compelled to prolonged waits in

the immediate vicinity of the front line, where the machines could not be given the necessary care nor the men their indispensable rest, the tanks were employed in highly unfavourable conditions—imposed as these were by circumstances, by the critical situation of corps and divisions which had no reserves, by the exhaustion of the units in the line which needed immediate help to disengage themselves from the enemy's too active pressure or to assist them to regain their lost positions, men and machines were subjected to a hard test from which they emerged with flying colours. Had they failed the battle would have been lost."

Five weeks later there came the turning-point of the war in the West—the repulse of the second great German attack on either side of Reims and the French counter-stroke between the Aisne and the Marne. Preparations for this counter-offensive, though it had been for some time in the minds of both the Allied Commander-in-Chief Foch and the Commander of the French Army, Pétain, were not fully complete at the time the last great German drive began, but the scheme was persisted in and resulted in a resounding and important victory. In it the French tanks played as preponderant a part as had the British tanks at Cambrai, but their excellent work was not, as in that case, spoiled by preliminary or subsequent errors of leadership.

Four hundred and seventy-eight tanks, over half of them the new light Renaults, together with 100 heavy St. Chamonds and 120 Schneiders, were

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utilised on the battle front, and preceded the infantry to the assault. A slight fog and the absence of any preliminary bombardment, enabled them to burst in quite unexpectedly on the enemy, some of whom were found armed only with scythes, going peacefully out to reap the standing corn behind their thinly held, somnolent front lines. The tanks' progress at first was remarkably speedy and deep-reaching, but the following infantry then began to drop back or were held up, and they suffered considerable casualties. By that time, however, the victory had been won, and the line of retreat of all the German forces holding the pocket formed by the southward-bending line between Soissons and Reims was so imperilled that they had no resort but retreat. They were able to extricate themselves without being cut off, but only at the price of serious losses in men, material and morale, their escape every day endangered by renewed attacks against their flanks and rear in which all available French tanks, though dwindling in numbers daily, continued to play a leading part. By the time the Germans had all got back across the Aisne, their offensive spirit had been broken for good and all and the initiative had passed to the Allies. For this decisive result the French Tank Corps losses—160 tanks out of the 478 that had first gone into action on July 18th, and 15% of their personnel—were truly an economic price.

Before long the British Tank Corps had a chance to rival this feat of arms. It had already shown

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itself fully fit for action again, despite its trial and losses during the German offensive, in a brilliant little action at Hamel, outside Amiens, on July 4th. "In rapidity, brevity and completeness of success," it has been said, "no battle of the War can compare with it." Sixty tanks were employed, of which all but five, temporarily disabled, got back undamaged after fully accomplishing their task. The casualties among personnel totalled only 13 wounded, and the losses of the Australian infantry co-operating were only a few more than the number of enemy prisoners taken. Henceforward the disastrous memories of Bullecourt were clean wiped out, and the Australians were as loud in praise of the Tank Corps and all its works as they had been previously in scorn and condemnation.

Then on August 8th came what Ludendorff afterwards called "the black day of the German army" and the Tank Corps' greatest day of triumph. Marshal Foch had issued orders to all the armies under his command to take advantage of the turn of the tide on the Marne and pass to the offensive before the enemy could recover themselves. General Rawlinson, commanding the British Fourth Army before Amiens, was entrusted with the task of carrying out the first of the British attacks, so as to drive the Germans back from the vicinity of that important strategic point, and so impressed had he been with the Hamel victory that he was readily persuaded to make it a tank battle. All preparations were carried through swiftly and secretly under the

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poses of enemies who, grown slack and careless, had made no adequate preparations for defence and were able to put up little effective resistance, when in the misty grey of the dawn of August 8th, the fire of 7,000 guns opened with a sudden deafening crash and 420 tanks loomed up everywhere before their scanty wire and ill-dug trenches.

There followed a scene of confusion and rout. British, Australian and Canadian infantry, with heavy and medium tanks ahead and in the midst of them, pushed ahead into hostile land, unopposed save by scattered parties of disorganised, disheartened foemen, and attained with great ease and little loss distant goals assigned in what most of them had thought a spirit of the wildest optimism. Far in front of them the advanced medium tanks, together with the armoured cars that now formed part of the Tank Corps, shot up enemy staffs at their breakfast tables, made wreck of enemy transport columns which took them for vehicles of their own until too late to escape, overran batteries, camps and wagon-lines, and sent the guards and caretakers over dumps and store depôts scampering for their lives. When our infantry came to a halt, the cavalry thrust through them and took up the running, and by the end of the day the enemy line had been breached to a depth of ten miles and 16,000 men and 200 guns had fallen into our hands as trophies of victory. One hundred of our tanks only had been put out of action.

It was no part of Foch's new offensive policy to persist with any one attack too long, once the

first surprise success had been achieved ; the point of pressure was then shifted and a new blow struck as soon as possible elsewhere, so as to bewilder the enemy high command and progressively weaken and exhaust its reserves. Thus, when in the next few days, the Germans having hurried troops to the Amiens area to fill the gap, it became clear from the gradual slackening of our progress and the rising of our casualty list that we had got all we could out of our victory, the attack was broken off and started again farther north. Now that the main brunt of the effort was to be borne, not by slow-moving masses of guns and slowly accumulating piles of shells, but by mobile squadrons of tanks, this could be accomplished with speed and secrecy. There now began that game of swiftly succeeding and bewilderingly alternating thrusts, here and there and everywhere, which in three short months bled the German armies to death.

Yet, though unknown to the Allies at the time, the victory of Amiens had more important results than mere material gain of ground or hauls of prisoners and trophies. It showed to the German commanders, as in a lightning flash, the hitherto unexpected and unsuspected moral weakness which had overtaken their armies. Their hopes of victory vanished ; an agreed peace must be negotiated, and that quickly, now that Germany could no longer wrest victory from her foes by the might of her conquering arm. And as the battle spread wider and wider in the ensuing weeks, the urgency of peace impressed itself

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more and more deeply until on October 2nd they sent out an urgent demand to their Government to buy it at any price, since at any moment there might occur a military catastrophe which would stretch Germany helpless at her enemy's feet. And the first reason given for the helplessness of her case was the hostile superiority in tanks, of which the German armies, even at this last stage of the War, had so few as to be of no value, and to which—more surprising still—they had never found an effective counter. At once there went out to President Wilson the first request for an armistice, and within six weeks the War was at an end.

We cannot here describe, even in outline, the part played by the Allied tanks in these last three months of incessant fighting which preluded the first curtain to the drama of the war in the West. Only a brief summary of it can be given. For the British Tank Corps it meant 39 days of actual battle, during which many of the personnel were in action as often as fifteen and sixteen times. There were in all 2,000 individual tank engagements, and over 800 machines at one time or another needed the attentions of the repair department, which was able to repair a quarter of them and send them back to fight again. Of the 10,000 officers and men on the combatant strength, a high proportion—close on 25%—became casualties—a heavy price even for victory, yet trifling compared with what many a division on the Somme and at Passchendaele had been called on to pay for failure and defeat.

The French Tank Corps too worthily kept up its record during these final weeks of the campaign. It fought on 45 days since its first great day of victory on July 18th, and counted on its battle rolls close on 4,000 individual tank engagements and a list of 2,600 names on its roll of honour of killed, wounded and missing. The Americans, too late in the field to furnish battalions of tanks of their own manufacture, had perforce to confine their efforts to providing admirable crews to man and handle French- and British-built machines. One unit in particular, the 301st Battalion, made itself a great name fighting on the British front ; and 140 American-manned tanks, fighting through the Argonne, were so severely tried in that fierce series of battles, that at one time or another every one of them had to go out of the line for repairs.

So the tanks crowned their brief career with continuous and pre-eminent services in all sectors of the Allied front during the first hundred days of victory, which at last put an end to the stubborn resistance of the heroic German armies and brought to a world weary and bled white by war the dubious blessings of a too-long deferred and uneasy peace.

CHAPTER V

WHAT TANKS MIGHT HAVE DONE IN 1919

BEFORE we leave the events of the Great War, we must devote a few pages to what would have been, had it ever taken place, the largest and most important tank operation since the invention of the weapon, for, as we shall see later, the operation—or rather the project for it—foreshadowed in many respects the subsequent development of tank warfare.

As early as the spring of 1918, tank requirements and plans for the next year's campaign were being discussed at Tank Corps Headquarters. None there, or anywhere else, imagined at that time that Germany could be forced to sue for terms before the end of 1918, and it was decided that, in addition to the new Mark V heavy tank, which it will be remembered was actually issued in large numbers in time for the summer and autumn battles, there should be a new light tank so far ahead of anything hitherto contemplated in speed and general performance, that it would come as a complete and terrifying surprise to the enemy. This tank, known as the "Medium D," was to be faster and more powerfully engined, and have a far greater radius of action than the old type "Medium A."

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Not only, however, was it to be of improved design, but it was hoped to use it in a radically different manner. The project drawn up by Colonel Fuller was based on the new and revolutionary idea that the object of this, as of every other war, the destruction of the enemy's fighting strength, should be sought, not as heretofore by killing, wounding, or capturing the personnel of the hostile armies, but by putting out of commission their machinery of maintenance and command. If this machinery of command could be unhinged by suddenly removing the brains of their Army Corps and Divisional Headquarters on a wide front, the collapse of the personnel they controlled would swiftly and undoubtedly follow; and if at the same time their machinery of maintenance could be disorganised, they would be faced with the alternative of starvation or dispersal. This then was the basic idea of the plan—a blow at the German Army's brain, represented by its headquarters, and at its stomach, represented by its supply services.

The way the idea was to be worked out was to select a front of about 100 miles on which obvious preparations for an old-style grand attack were to be made, so as to attract the enemy's attention and induce them to mass large reserves to meet it. Then suddenly, without any warning, a fleet of the new, fast "Medium D" tanks would be launched which would cross the enemy front at top speed and make direct for all their headquarters on the front of attack. The rearmost of these, the Army Headquarters, which were known

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to be situated some 18 miles behind the lines, were to be reached and put out of action in two hours. Meanwhile our air force would systematically bomb all road and supply centres, but would leave signal communications intact, so as to allow the alarming reports of the attack, and the confusion expected to result from it, to be as widespread as possible.

No sooner had this confusion reached its height than a powerful regular attack, with infantry, artillery and heavy tanks, was to be launched, and to press forward and occupy all the zone, extending back some six miles from the front line, in which the bulk of the enemy artillery was in position. As soon as a wide breach to that depth had been effected a pursuing force, consisting of all available medium tanks, and infantry carried on lorries, was to be thrust through and to push rapidly ahead, sweeping away all centres of communication, all important headquarters, all reserves, and all the maintenance and supply organisation. Every German G.H.Q. was to receive attention by having several hundred tons of bombs dropped on it ; " this at least," the plan stated, " will neutralise clear thinking."

It was expected that this pursuing force would be able to advance at the rate of some 20 miles a day, the lorry-borne infantry operating where tanks could not, and forming a protective line at night to allow the tanks to rest and refit. Cavalry were also to be used if they could get forward and keep up. All artillery and engineers with the

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pursuing force were to be tractor-drawn, and the Royal Air Force were to watch over and guide and co-operate with the pursuit throughout.

It was calculated that for the execution of this novel and grandiose plan there would be required: for the "disorganising force" 800 medium tanks, for the "breaking force" 2,600 heavy and 400 medium tanks, and for the "pursuing force" 1,200 medium tanks. This gave a grand total of 2,400 medium and 2,600 heavy tanks and of 65,000 men as tank crews, of which more than a third were to be provided by the British, and the rest in about equal proportion by the French and the Americans.

Such, in brief outline, was the 'Tank Corps' plan for 1919. It was adopted by the Allied High Commands more or less as it stood—and that fact alone is an eloquent and remarkable testimony to the work of the tanks, which had now convinced even the most sceptical, by the sheer, overwhelming force of indisputable fact, of their unequalled value as a war winner. A few months earlier such a scheme would have found its way at once to some wastepaper basket and its author would most likely have been relieved of his post as an irresponsible madman. Now it was whole-heartedly adopted, not only by British G.H.Q. and the War Office, but by Marshal Foch, who wrote of it:

"I agree in every way with the main principles of the study you have kindly sent me. Tanks are indispensable for clearing the way and supporting the rapid advance of the infantry. They must

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be used in as large numbers as possible ; consequently construction must be hastened."

This project, however, was never to be more than a mere paper scheme, for within a week or two of its final approval by those who would have had the task of carrying it out there began the series of decisive Allied offensives, which put an unexpectedly rapid end to the War and so made its execution unnecessary.

No one, least of all one who, like the present writer, himself fought in the War and knows what war means, can for a single instant regret that "Plan 1919" remained a plan only. It is none the less true that the operation it envisaged would have been from a purely technical point of view of the highest interest and value. Had it been carried out, many of our ideas as to the future of tanks in war, founded as they would have been on a solid basis of historical fact, might have been more or less ambitious, but would certainly have been less theoretical and diverse than they are to-day.

CHAPTER VI

WHAT TANKS ACHIEVED IN THE GREAT WAR

It has been often asked, "Who (or what) won the Great War for the Allies?" And in exactly the same way as claims have been put forward, mostly by interested parties, for the naval blockade, the heroes of Mons, Lenin, and the United States of America, so it has sometimes been said that the tanks really won it. It would ill become an officer of the present-day (though not of the war-time) Royal Tank Corps to put forward so exaggerated a claim, but neither is it necessary for him to depreciate the services rendered by the Corps to which he had the honour to belong to the victorious Allied armies in the West.

What then should be the final verdict on the part played by tanks in the War?

As regards the opinion of British commanders and soldiers, we have seen that the Tank Corps had to fight its way to vindication in their minds just as hard and as long as it had to fight to overcome the resistance of the Germans on the battlefield. The matter-of-fact, unimaginative British temperament is slow to absorb, though not necessarily unable to conceive, the idea of some new thing, and healthily, if sometimes irritatingly, inclined to doubt the value of anything

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it has not seen and tested for itself. That the tank at length fully proved its value in British eyes is the strongest conceivable testimony to its worth as a weapon of war.

As a proof that it did so, let us take two witnesses only: The first is that of Lord Haig, who, as we have already seen, took long to convince of the value of the tank, and who, as late as the autumn of 1917, spoke of the tank to an enthusiastic tank advocate as "a minor factor under present conditions—an adjunct to infantry and guns." Right up to the end of the War he was never a tank enthusiast, for his limitedly orthodox mind and conservative temperament precluded enthusiasm in him for anything not made venerable by tradition. But even he in the end came to realise the value of the new arm, and the praise given to it in his final despatch after the end of the War must be regarded as high praise indeed, considering the source whence it came:

"Since the opening of our offensive in August the tanks have been employed in every battle and the importance of the part played by them can scarcely be exaggerated. . . . It is no disparagement of the courage of our infantry, or of the skill and devotion of our artillery, to say that the achievement of these essential arms would have fallen short of the full measure of success had it not been for the very gallant and devoted work of the Tank Corps, under the command of Major-General H. J. Elles."

This opinion only reflected that of his subordinate generals who had been equally completely

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converted. Before the end of the War, indeed, to quote General Fuller's words in his memoirs : "There was scarcely a Corps, Divisional, or Brigade Commander who was not yelling for tanks morning, noon and night."

But most valuable, perhaps, in some respects, because they were based on personal experiences while fighting in close co-operation with tanks in the heat of battle, were the words of an anonymous infantry officer, in no way connected with or interested, save as a good soldier desirous of his country's victory, in the Tank Corps or the tank :—

"The moral effect of the support given by tanks on the attacking infantry is very great. They are invaluable if properly handled. Nothing has yet been produced in this war to equal the tank for doing by machinery what has hitherto been done by men—nothing so well fitted to economise our man power and reduce the appalling wastage which has hitherto characterised our effort : in attack—with gain instead of loss in efficiency. We want thousands of tanks."

Let us turn from the British to the French and we shall find the general opinion just the same. Marshal Foch shall speak first :

"The machine-gun and the barbed-wire entanglement permitted defensive fronts to be extended over areas quite impracticable until this time. The offensive for a time was powerless, new weapons had to be sought for and tanks were invented—machine-guns or guns protected by armour and rendered mobile by petrol, which

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succeeded on all types of ground in mastering the enemy's entanglements and machine-guns."

Then comes the voice of the French Minister of Munitions, speaking of what he had learned in his talks with front-line officers and troops :—

"There are two kinds of infantry : men who have gone into action with tanks and men who have not, and the former never want to go into action without tanks again."

Best testimony of all to the merits of the tank is perhaps that which comes from the enemy. It is multivocal, yet unanimous. "It is to the tanks that the enemy owes his success," wrote Ludendorff, after the French victory of July 18th, 1918. "As soon as the tanks are destroyed, the whole attack fails." "When the English succeeded in achieving a great success, the reasons are to be sought in the massed employment of tanks and surprise." "The superiority of the enemy at present is principally due to their use of tanks."

All these extracts from official German orders or documents issued during the War lead up to the view expressed by the German High Command in October, 1918, when, compelled to explain to the party leaders of the Reichstag the reason for its sudden decision to sue for peace, it stated in round terms :

"Two factors have had a decisive influence on our decision, namely, tanks and our reserves. The enemy has made use of tanks in unexpectedly large numbers. In cases where they have suddenly emerged from smoke clouds our men were com-

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pletely unnerved. Solely owing to the success of the tanks, we have suffered enormous losses in prisoners."

And after the end of the War, a German historian, who himself had held high command in the defeated army, summed up the German view in one pithy sentence: "It was not the genius of General Foch that defeated us, but 'General Tank.'"

As regards the value of the tank, then, we may say that all three belligerents whose armies bore the brunt of the four years' fighting on the Western front—the only one where any force of tanks was used—were substantially agreed on the main point at issue. It might not be true to say that the tank won the War; it is indeed untrue to say that armies, or navies, or propaganda, or the blockade, or any one armed force, or weapon, or factor "won the War." Victory came at long last as a result of a great combination of causes, among which perhaps the purely military ones were less predominant than would before the War have been anticipated, or is even now believed. But this at least may safely be said, as the conclusion of the whole matter. But for the Allied tanks, the German armies could never have been compelled to accept our armistice terms, equivalent to complete surrender, in November, 1918. The military victory of the Allies in the War, so far as it was purely military, could by no possibility have been achieved had tanks never been invented. Tanks may not have "won the War," but without them it would not have been won.

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What exactly were the services rendered by the tanks during the War? They may be briefly summarised as follows :

(1) They gave, when properly used in close co-operation with the other arms, a reasonable assurance of success to the attack.

“ On every occasion when tanks were used as a surprise in a properly co-ordinated plan with infantry, and protected by an artillery barrage with a proportion of smoke, the attack was an overwhelming success. The surprise lay not so much in the method of attack, as in the fact that the enemy could never tell when or where the assault would take place. In every case the utmost simplicity was aimed at and this included preliminary training between infantry and tanks, whenever possible, so that everyone knew exactly what he was required to do. These were the keynotes of our success—simplicity and surprise. On occasions we attacked without suitable artillery support and without a well-co-ordinated plan and these were almost invariably failures. On other occasions, tanks attacked a defensive position alone or a long way ahead of the infantry and their effect was very small. It was a suitable combination of the three arms—infantry, artillery and tanks—that led to the successes in our assaults on the enemy positions.”¹

Before the advent of the tank we had repeatedly attempted, without result, to gain victory by means of artillery and infantry alone. The addition of the tank as a third arm enabled us to

¹ Lt.-Col. G. le Q. Martel, *In the Wake of the Tank*, p. 35.

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gain the victory which, without it, had always been denied. It was the decisive element which, when thrown into the scale, tipped the beam possessed of it. Our commanders were able to plan for and count on winning battles, not easily, not always with full certainty, for in war victory against a worthy foe such as the Germans can never be easily won or regarded as a "sure thing," but with reasonable confidence and assurance.

(2) The tank enabled our armies to win reasonably, cheaply, and economically, successes which before its coming could not be won at all, or, if won, only at a cost out of all proportion to their value and to the cost to the enemy.

In a paper produced by the Tank Corps Headquarters during the War, in July of 1918, that is, even before the final battles in which the tank so transcendently proved its value, the following suggestive facts as regards what was therein called "Tank Economics" were given :—

"Man Power"

Owing to the fact that the tank provides a form of transport using mechanical power, the number of men required to keep a gun in action is greatly reduced compared with the other arms.

An artillery brigade requires 32·6 men per gun.

A machine-gun battalion requires 14·5 men per gun.

A wing R.A.F. (4 squadrons) requires 5·9 men per gun.

A tank battalion requires 3·1 men per gun.

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Casualties

Great reductions in casualties were effected by the use of tanks and corresponding increase in the proportion of enemy casualties.

During the preliminary bombardment at the Third Battle of Ypres we suffered 10,000 casualties from enemy counter-bombardment. At Cambrai tanks were substituted for this bombardment and our preliminary casualties were practically nil.

On the first day of the assault at the Battle of the Somme casualties amounted to 40,000.¹ In the case of the Third Battle of Ypres they were 16,000, and in both cases the enemy casualties were considerably smaller than ours. In the Battle of Cambrai, on the first day our casualties numbered 4,000 and we captured 8,000 prisoners.

Shells

In the Third Battle of Ypres the preliminary bombardment on a 17,000-yard front used 93,000 tons of shells, and the cost of manufacturing and firing these shells was approximately £15,000,000. At the Battle of Cambrai there was a preliminary bombardment, and only 5,000 tons of shells were fired on the first day. The 400 tanks used at this battle cost about £2,000,000 and the shells had no residual value, whereas tanks usually lasted for two or three battles. Over 3,000 tanks could have been built for the cost of the preliminary bombardment at the Third Battle of Ypres.

¹ Actually they totalled 57,000.

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Time

In all economics the most important factor is the economy of time. The tank was pre-eminently a time-saving machine in France.

At Cambrai a penetration of 10,000 yards was effected from a base of 13,000 yards in 12 hours. At Ypres from a base of 17,000 yards a similar depth of penetration took three months."

In September, 1918, Mr. Winston Churchill, the Minister of Munitions, and a firm believer in the tank from the first, wrote from France to Mr. Lloyd George, the Prime Minister :

"Up to the present there have only been about 18,000 men in the Tank Corps and they have only had 600 or 700 tanks to use in action. It is universally admitted out here that they have been a definite factor in changing the fortune of the field and in giving us that tactical superiority without which the best laid schemes of strategists come to naught.

"It is no exaggeration to say that the lives they have saved and the prisoners they have taken have made these 18,000 men the most profit-bearing we have in the Army.

"There ought to be 100,000 men in the Tank Corps."

At the end of the War, General Fuller, who had been Chief of Staff at Tank Corps Headquarters during the War, published the following eloquent figures which speak for themselves :

"As regards casualties, the comparisons are

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amazing. On the first day of the Battle of the Somme, July 1st, 1916, when no tanks were used, the British casualties were approximately 60,000. On the first day of the Battle of Amiens, August 8th, 1918, when 415 tanks were used, they were slightly under 1,000. Between July and November, 1916, British casualties per square mile of battlefield gained were 5,300 ; during the same months in 1917, at the Third Battle of Ypres, they were 8,200 ; and during the same period in 1918 they were 83. In the third period alone were tanks used in numbers and efficiently."

We see from these figures that the tank was an economical and therefore profitable machine of war, saving as it did man-power, money, time and casualties and showing greater gains of ground and trophies for these diminished costs.

(3) It may be—indeed, it has been—said that these figures give an unfair picture because the German armies, physically and morally, were no longer in 1917 and 1918 of the same high quality as in 1916. This is true, though exactly the same decline of quality manifested itself in the Allied armies. Physically, indeed, they had lost more heavily and their morale too should therefore, one would expect, have been lower. Napoleon said that in war the moral is to the physical as three to one. Marshal Foch quoted with approval in one of his pre-war writings a maxim of Joseph de Maistre : "Only those battles are lost which the defeated side believes to be lost."

But into the moral, no less than in the physical balance, there had meantime been thrown the

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weight of the tank. Its moral effects, both on its friends and on its foes, were as great as its material effects, if not greater. In the one they instilled confidence and belief in victory, in the other certainty of defeat. Even the Germans, who never themselves had more than fifty tanks during the War, appreciated to the full the moral advantages of their possession : " Our tanks," ran one of the Army orders, " strengthen the moral of the infantry to a tremendous extent, even if employed only in small numbers, and experience has shown that they have a considerable demoralising effect on the hostile infantry." Indeed, on the very few occasions on which the Germans used tanks their effects were entirely moral—and yet very considerable, and they brought about widespread and rapid retirements on the part of the Allies' infantry. It is on record that a complete panic was once caused by the appearance before our lines of a salvage officer who had retrieved three abandoned steam ploughs from No Man's Land and was bringing them in. The cry went up : " German tanks!"; several thousand men abandoned their positions and fled, and the alarm spread right back to the higher headquarters behind, and even, it is said, to the bases on the Channel coast, before it was realised to be false.

As for the effect of our far more numerous tanks on the Germans, these were so marked that by August, 1918, the German High Command had taken to explaining all the Allied victories as a matter of course by our use of vast hordes of tanks. The result was that before long the German

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regimental officers and men began to believe that the mere sight of our tanks excused them from any further attempts to hold their ground, and sufficiently justified retreat or surrender. "Your tanks had arrived ; there was nothing to be done," was the plea often put forward even by German officer prisoners to their captors. In fact, before the end of the War, the infantry on both sides had fully realised that against enemy tanks they were no better than unarmed and helpless.

All the more uplifting and encouraging, therefore, was the realisation, which we had and the Germans had not, that in our possession of this powerful weapon, of which all knew the great potency, we enjoyed a form of great and growing superiority. It was like the knowledge of a card-player that he holds the ace of trumps, and in the end no commander who valued his own reputation and his men's lives, and no troops who had once seen what tanks could do, would ever willingly dispense with their aid, if they could get any, even a few, machines to help them. It was the moral support thereby afforded that was now more sought after and indispensable than the material.

We have no space here to tell of the many auxiliary services rendered by tanks and the Tank Corps during the Great War—of the armoured cars which so distinguished themselves at the Battle of Amiens, and subsequently as to earn the signal honour of being the first British troops to cross the Rhine and enter Cologne after the Armistice ; of the supply and gun carrier

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units which hauled forward rapidly and cheaply to the fighting machines the petrol, oil, ammunitions and spare parts they needed and large quantities of ammunition, supplies and stores for the other fighting troops. We have perforce confined ourselves to telling, too briefly and baldly indeed to be worthy of the theme, only what the "fighting tanks" did to help their comrades and the cause of the Allies on the battlefields of the Great War. But for the services of the fighting tanks, many more of these comrades must have been condemned to wounds and death, and, it is not too much, perhaps, to say, the cause itself to failure or defeat.

CHAPTER VII

SPECULATING IN MILITARY FUTURES

WE have now outlined the part played by the tank in the World War which ended twenty years ago. Now we must pass on to the true purpose of this book—to estimate the rôle and importance of tanks in a future war. How far are the experiences of the last war to be taken as sound guidance in the matter ?

It is a common, and not unfounded, reproach against all armies that, although it should be the object of all their training in peacetime to prepare for the next war, they tend rather to prepare for the last—if not, as is sometimes even more unkindly said, for the last but one. There is certainly ample warrant, and on very high authority too, for the universal belief among military men that the study of campaigns and battles of the past is of the utmost value as a course of training for those of the future. Any number of great men of the past have given their blessing to this belief. Bismarck, though not himself a soldier, said that he left it to fools to learn from their own experience ; he himself had always managed to avoid blunders by learning from the experiences of others. Napoleon advised all soldiers to read and re-read the campaigns of

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the great captains, as the only method of surprising the secrets of the art of war. Marshal Foch quoted with approval the saying : " The history of war is in peacetime the true means of learning war and of determining the fixed principles of the art." And—to descend somewhat from the sublime—Sir W. S. Gilbert's Major-General Stanley could proudly say of himself :

" I knew the Kings of England and I quote the fights
historical

From Marathon to Waterloo in order categorical."

thus deservedly calling forth the enraptured encomiums of his (possibly not altogether impartial) daughters and of the pirates of Penzance that :

" Still in matters vegetable, animal and mineral,
He is the very model of a modern Major-General."

Yet it must be admitted that in thus seeking inspiration for the future in the past—often the very remote past—the military stands almost alone among the learned professions, who usually tend solely to regard the present and the future, with at most a cursory and possibly impatient glance at history. Few members of the Surveyors' Institute, one may presume, have spent much time in the study of Domesday Book. The constructional details of the Tower of Babel have little interest to-day for the architect. The doctor no longer believes in the universal panaceas of bleeding and leeches, sanctified as these are by centuries of tradition and practice—true though

it is that Voltaire once dealt a shrewd double-barrelled blow at two worthy and respected bodies of professional men when he compared the arts of medicine and war as being both alike "murderous and conjectural." Only, indeed, to the lawyer is "Wil. & Mary VI. cap. 17" still of moment; only some of the clergy spend time, ink and paper in endeavouring to identify the exact location of the crevasse that enshrines the mortal remains of Korah, Dathan, and Abiram; and only for the soldier is the thorough study of, say, the Peninsular War still regarded as of great value and profit. Why is this? Why should he who desires to foresee and prepare for a war of the future be constantly reverting in his mind to the wars of the past?

The real reason, and a most fortunate one for the world in general, is that the soldier whose profession is fighting is not engaged in the daily practice of it, as are the surveyor, the architect and the doctor—or at least the more popular and prosperous members of those callings. Indeed, there have lived and served and died—in their beds—many soldiers of all times and of all nations, who rose to high rank, acquitted themselves with credit, and made for themselves considerable reputations, but never in all their lives had the opportunity for practising their true profession of fighting at all. And military history teems with the names of generals called to command in war whose only practical preparation for it consisted of participation in some long-forgotten campaign in the far-distant days of

their hot youth—and yet a good proportion of them achieved victory and fame. Some had a natural talent for generalship which helped to carry them through, but many who had this talent, and many who had it not found, their peacetime study of and meditation on the art of war and its principles, as exemplified in the campaigns of the past, an ever-present help in the day of tribulation.

Unfortunately for the soldier, in view of the fact that in an era when wars are occasional rather than frequent phenomena, his knowledge of his profession must always be more theoretical than practical, a little learning is a dangerous thing—and so, sometimes, is a lot of it too. It is not enough to acquire a rudimentary, or even an encyclopædic knowledge of the “ fights historical from Marathon to Waterloo ”—or even to Amiens or Megiddo—to be “ the very model of a modern Major-General.” For the tendency of all men—of soldiers not least among them—to mistake the temporal and the temporary for the eternal, to trust to what has been tried and proved in the past to be good and valid, is thereby perilously reinforced, so as to blind them to what lies in the womb of the present—and still more, if we may venture to press the metaphor to an indelicate point, to what may be prematurely extracted from the womb of the present, by a sort of Cæsarean operation, for future use. For swift and profitable victory in war has almost always fallen to the pioneers who

have been the first to think of, adapt, or adopt "some new thing"—a new weapon, a new device, a new system, a new method—undiscovered, though not undiscoverable, by the orthodox, by those whom Napoleon called "the good average generals." It is for some such "new thing"—for some means of catching possible foes by surprise and unprepared to meet it—that commanders, and General Staffs, and War Offices should always be watching, particularly in these modern days when science and technics are ever extending the boundaries of human knowledge and power. But such a state of vigilance and investigation is not easily ensured in the profession of arms because the study of war, in so far as it is practical at all, must base itself mainly on the events of past wars. Moreover, the social and professional seclusion, in which army officers of all nations nowadays normally pass their lives from a very early age tends to enwrap them in a sort of cocoon, combined of routine and orthodoxy of body and mind, through the deadening folds of which the influences of the outside world can only with difficulty penetrate.

For soldiers in peacetime the only practical basis of preparation for a future war must always and inevitably be the practice of the past. But this reliance on past practice must be tempered with clear thinking and eternal vigilance, to avoid the danger of a wrong interpretation of its lessons and of a belief that means and methods which have served well under certain given conditions will serve eternally—or at least for the present

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and the immediate future, with which alone most soldiers are concerned.

What we who speculate in military futures have ever to ask ourselves, when we try to estimate the future value of some military means or military method, is, first : What does the military history of the past tell us about it ? What were yesterday its powers, its limitations, its potentialities ? Under what conditions, favourable or unfavourable, was it then operating ? And when we have answered these questions to the best of our ability, there come the further questions :

How far are these conditions likely to prevail in a war of to-day or to-morrow ? In what respects, if any, have they changed ? How will any such changed conditions affect the powers, the limitations and the potentialities of the military means or methods we are examining ? What has been done, or can be done, to adapt these means or methods to meet such changed conditions ?

Only when we have examined, and as far as possible answered, these questions can we hope to arrive at an answer which will deserve to be called more than conjectural, and to avoid the murderous consequences that usually result from mistaken forecasts of prophets in the art of war.

CHAPTER VIII

CONDITIONS UNDER WHICH TANKS FOUGHT IN THE GREAT WAR

IN pursuance of the scheme outlined at the end of the last chapter, let us therefore examine the conditions under which tanks fought and achieved their striking successes in the Great War, as a preliminary to inquiring if similar conditions will again prevail, and similar successes are likely to be achieved in any future conflict.

The first wartime tank was invented and designed, it will be remembered, as the answer to a definite military problem facing the Allied armies in the West—the problem of how to overcome the resistance of an enemy heavily entrenched behind dense belts of barbed wire and armed with masses of machine-guns, the fire of which rendered the orthodox infantry attack either utterly impossible or immensely costly in casualties. The tank was designed as a means of assisting the infantry to penetrate the belts of wire, storm these trenches and get to close quarters with the enemy, without being annihilated or suffering crippling losses in the process.

As its purpose, therefore, was to assist the infantry and act in close co-operation with them, it was not necessary for the machine to have any

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great turn of speed—something a little in excess of the average walking pace of a heavily laden infantryman would amply serve. It had to be of sufficient length to be able to straddle the width of the normal enemy trench and cross it. It had to be heavy enough to crush down belts of wire. It had to be armoured sufficiently to keep out ordinary bullets. It had to have continuous all-round tracks to enable it to get across any kind of normal country. And it had to carry weapons to cope with and destroy any resistance likely to be met with. All these requirements were embodied, as far as technical knowledge at that time could manage it, in the earliest patterns of tanks, and subsequent modifications were made as experience showed them to be necessary. Thus it soon became essential to add thicker armour to deal with the menace of the armour-piercing bullet, the efficiency of which the Germans began to realise early in 1917, after the capture of two of our tanks at Bullecourt. Some of our war patterns of tanks had to be made of extra length to enable them to cross the extra wide trenches which the Germans were known to be digging to serve as tank obstacles. But the general specifications of the heavy tank, designed to solve the particular problems of the trench-warfare attack, remained unaltered from first to last.

In 1918, however, new species of tanks were designed for altogether different purposes. The contending armies had by then sufficiently shaken themselves free of the trammels of their trenches

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to give some hope of a return to the mobile fighting in the open field, which for four years both had tried in vain to bring about. For this anticipated semi-open warfare a medium tank, smaller, shorter, faster, and less powerfully armed, was designed by the British, and a light, two-man type, even smaller, handier, more inconspicuous, and cheaper to build, which could be used in very large numbers as a weapon of opportunity, was preferred by the French. Both these types were to be used, after the heavy machines had breached the hostile lines, to pass through the gap thus made and help the infantry to deal with the resistance it would be bound still to meet in the open country beyond. They would, it was expected, be called on only to cross hastily dug trenches and natural obstacles such as banks, ditches and railway and road cuttings, of which it must be remembered there are far fewer on the Continent than in this country, but they might have to keep pace with cavalry or infantry carried on lorries—indeed, the French hoped to carry forward fleets of their little light machines themselves on lorries to the edge of the battlefield and loose them on to it like a pack of hounds from a travelling kennel.

Conditions of fully open warfare, in actual fact, were never reached on the Western front; but the French light tanks, and to a lesser degree our own medium machines, were employed in great numbers, and with considerable local success, during the semi-mobile operations in the summer and autumn of 1918, when the only

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obstacles they had to encounter, were single lines of temporary trenches, with little wire in front of them, and the normal accidents of the ground. The newest and fastest type of British medium tank, designed first and foremost as a "pursuit" machine, never, as we have seen, had the opportunity to show what it could do in the field.

The Great War, therefore, in sum, bequeathed to the military world three types of tanks which had proved their value in actual combat :

(1) The very slow, heavy type, designed to overcome the resistance of the semi-permanent, fortified defence lines of stabilised trench warfare.

(2) The slow-moving, medium tank, designed to deal with the less formidable and non-continuous defences likely to be met with once the enemy had been driven from, or induced to emerge from, his semi-permanent trench lines.

(3) A slow-moving, light tank, or open-warfare weapon, capable of being transported by lorry to the battlefield, and used lavishly and in large numbers to help the other arms to overcome hostile resistance as and when encountered.

The fast light tank, though designed and built, had never yet been tested and proved in action.

The military problems which these various types of tank were designed to solve, however, were complicated by another one, upon which hitherto we have not touched. It is a commonplace of military doctrine that to every new weapon of war there is before long found a counter. We must now glance at the attempts made by the

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Germans to find a means of countering the Allied tanks.

It has been said, and with much truth, that the best counter to a tank is another tank. Be this as it may, the Germans made no attempt to build tanks of their own in sufficient numbers to meet and defeat our machines. A handful were built in the early part of 1918 and took part, together with certain captured and reconditioned British tanks, in half a dozen actions, on the results of which they had considerable moral, but no material, effect. They were, as we have seen, clumsy and inefficient vehicles, in no way comparable with ours, which indeed they encountered on only one occasion.

The only other weapon specially designed for anti-tank work by the Germans was a large, heavy rifle, firing a heavy armour-piercing bullet. After twenty shots it got too hot to hold, but so fierce was its "kick" on discharge that very few of the men to whom it was issued could be induced to use it. Towards the end of the War it was reported that the Germans were about to issue new anti-tank machine-guns, and anti-tank guns that could be carried on lorries, but neither of these ever appeared in the field. Mines too were used to serve as a defence against tank attack, but on a few occasions only.

For the greater part of the War the enemy relied primarily for anti-tank defence on the ordinary weapons they already possessed. Up to the spring of 1917, the fire of rifles or machine-guns using armour-piercing bullets was effective, but from

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the time of our introduction of the Mark IV tank in the summer of that year, the German infantry were left practically without defence of their own against tank attack and had to rely on their artillery. German field guns, reinforced on a few occasions by mortars which were sited well up in the front lines so as to be able to take on our machines with direct fire at short range as soon as they appeared in sight. A direct hit by an artillery shell usually stopped or destroyed a tank, and as time went on the enemy had to devote more and more of their artillery to this dangerous yet vital task. By the end of the War, one German gun in three was needed for anti-tank work in battle and therefore not available for other normal artillery tasks of importance. Though these guns often inflicted severe casualties, the imperfect security they were able to afford their infantry was dearly purchased; the gun crews lost heavily in every battle and a high proportion of their guns were over-run and captured or destroyed. Anti-tank defence by artillery, in fact, proved in the long run neither economical nor effective.

In fact, the verdict on the whole German anti-tank policy in the War must be that it was a complete failure. The German commanders never managed to find a true counter to the tank because they made exactly the same mistake about it as we ourselves did. They thought it of no value, and so did not trouble either to build tanks for the German army, or to discover the necessary weapon to counter our own. Not till the end of

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1917 did they⁷ begin to realise their error ; and by then it was too late to rectify it. The economic situation of Germany was then so bad that tanks and anti-tank weapons could be manufactured only at the expense of other vitally necessary war material ; nor could she afford the necessary time, even had she had the necessary means, to manufacture them, if she were not to lose her one fleeting chance of beating the Allies before the masses of American man power began to flow in to reinforce them. So in the spring of 1918, the Germans attacked without tanks, and were held, and in the summer the Allies, with tanks, attacked them, still unprovided with effective anti-tank weapons, and beat them to their knees. In this matter of tanks and anti-tank defence, in fact, the Germans had let the Allies get too long a start, which they were never afterwards able to catch up. Perhaps they too believed that every new weapon of war always finds its counter. But in this case, as has happened before, and may well happen again, the War was lost before the counter was found.

CHAPTER IX

BRITISH TANKS SINCE THE WAR

WHEN the Great War came to an end in November, 1918, the British Tank Corps was the most efficient and the best equipped in the world. But, as with many other things, the coming of peace brought a change. The world had been bled weary of war, and what need could there be of great armies and navies and air forces, now that the war to end war had been fought and won? It must be remembered that the British armies which had fought from 1914 to 1918 had, after the first few months, consisted of civilians turned soldiers, and their first desire, now that it was all over, was to get back to civil life. The end of the fighting left behind it many a stormy legacy of disorder all over the world, but these had to be left to the newly enlisted soldiery of peacetime to settle, for the men who had survived the War had had enough, and left the colours as soon as they could be released.

Among other things, this change-over involved the demobilisation of practically the whole of the personnel of the wartime Tank Corps, and their replacement by others, most of whom had never handled or fought in a tank before. What was more serious, the personnel of the design department, who had been responsible for all tank

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production, also disappeared and were replaced by a much smaller and less experienced staff. The result was that all research work stopped, and the Tank Corps was left to do the best it could with old machines and new men. Things remained in this state of suspended animation for five years. They were years of much theoretical discussion and progress, but as far as practical utility was concerned, the British Army had lost its wartime lead in tank warfare. The state of the R.T.C.¹ was eloquently symbolised to any visitor to its headquarters at Wool, in Dorset, by the sight of ancient wartime heavy tanks creaking and groaning and rattling their way across the heathland in the prentice hands of youthful drivers, and of rank upon rank of derelict and rusty medium machines, which had been delivered too late for the last war and would be out of date for any future war.

However, this sad spectacle caused little anxiety to those responsible for our new army, if any of them ever saw it—for there was a general and, as it turned out, well-founded belief that we could count on at least fifteen years' respite from the danger of any large-scale war. But the possibility of a campaign somewhere on the frontiers of our far-flung Empire against a second-class enemy² always existed in this disturbed post-war period.

¹ Official abbreviation for the Royal Tank Corps. The prefix "Royal" was granted to the Corps by King George V. in October, 1923.

² There is reason to believe that Turkey or Russia (still weakened by the effects of her sanguinary Revolution) were the possible enemies in mind. We were, it will be remembered, very near to war with Turkey in 1922.

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For such a campaign, as our experience in Palestine in 1917 showed, the heavy tanks we had were unsuitable ; there would be few trenches and no stabilised trench warfare, and the machines we should require for the mobile operations to be expected would be either mediums or lights. The R.T.C. had no light tank of any kind, and its mediums were the worn-out and obsolete Medium A's which had fought in 1918, or the few first Medium D's, designed for the 1919 break-through described in Chapter VI, which were too mechanically defective to be of much use.

The first thing to be done was to issue a new medium tank, and in 1923 this duly made its appearance. As a vehicle it was well in advance of anything yet produced by any country, its maximum speed being about 20 m.p.h., and its power, cross-country capacity, and radius of action reasonably high. But as a fighting machine it left something to be desired. Whereas the wartime type of heavy tank had its tracks all round its body, the new "Vickers Medium," as this latest machine was officially called, had a low carriage with a short base, and carried a superstructure in which the crew rode and fought. The inevitable result was that while the wartime tank crawled, rolled, or wallowed its way about, the new one bounced, pitched, and tossed in a way which made accurate fire from it a high art. It was difficult for the commander to control either his driver or his machine-gunners. He had himself not only to command his landship, but

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also when, as happened in a few years' time, wireless was fitted to all tanks, to operate that as well. All this gave him too much to do, unless he were one of those rare and accomplished people capable of operating with head, arms, hands, legs and toes that combination of musical instruments known as a "one-man band." Moreover, the first model of this new tank was so thinly armoured that at close range even ordinary bullets would penetrate it; thicker armour was added to a later model, but the effect of thereby increasing its weight was seriously to slow it up and increase the wear and tear on its engine and tracks.

It is sad to relate that though at the time of writing more than fifteen years have passed since this medium tank was first issued to the British Army, it is still the only one it has. There has been no shortage of new designs and even of new models. Within six years there had been produced a prototype of a far better machine than the one in use, known as the "16-ton tank," twice as fast and as powerful, half as thickly armoured again, and with a far greater cross-country capacity, yet much steadier in motion. Its fighting efficiency too was greatly increased by the lay-out of its guns in separate turrets, the provisions for fire control of his crew by the commander. But before this fine machine, far ahead of anything we or any other nation had designed up to that time, was ready for production, the great slump was upon the world and the great wave of pacifism on top of it, and there was no

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money for evil and useless things like armaments. So this tank was never issued. It was not till 1936 that the Government decided that in a world which had recovered from the slump and was feverishly engaged in re-arming with a speed and purpose unequalled even before the "War to end war," for Britain to continue perilously unprotected was no longer possible. But when the previously tightened purse strings re-opened for the fighting services, the 16-ton tank was eight years old and out of date, and no other design of medium tank was in existence. There was debate and delay, and though at last a design for a new medium tank of satisfactory type has been approved, it has yet to reach the men who will have to learn how to maintain and use it when they get it. In fact, as regards its main weapon, the medium tank, "the years that the locusts have eaten" have for the British R.T.C. been longer and more barren than they need have been, or should have been allowed to be.

Nor have they been any less so as regards more heavily armoured tanks for working with infantry. Here admittedly the need was less urgent. It was considered in 1919 that even in the highly unlikely event of a major war in the near future, the first aim of all the belligerents would be to keep the operations fluid and open and to avoid a return to the gruelling trials of trench warfare that had made the Great War so prolonged and distressful a business even for the ultimate victors. It therefore seemed unlikely that we should need heavy tanks at all in the near

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future, even in the remotely possible event of our becoming involved in a European war again, so that we should be amply safeguarded against any dangers of being caught napping without them if we designed a new type and made all preparations to go to production with it at short notice should it be necessary. Within the last two years, however, a good deal of work has been done towards producing a modernised "infantry tank." But as the machine itself is still in the experimental stage, we need devote no more space to it here.

There remains to be outlined the development of the present-day light tank, of which the British Army had no prototype during or for some time after the War.

It was obviously desirable to have some sort of small, inexpensive machine to send ahead of the larger and more expensive medium tanks and prevent their running unawares into anti-tank guns or minefields at close range, but up to 1925 nothing had been done in the matter. It was then suggested that such "mosquito" tanks would also be of great help to the infantry, whose helplessness to attack strong, hostile positions on their own had been clearly shown very early in the War, and that a proportion of the infantry might be converted into "mechanical knights" by mounting them in small, fast, lightly-armoured tanks. Experiments made it clear that the machine must be a two-man one, even though this considerably sent up its hoped-for cost, and on this principle it was produced. Thus, the first light tank ever in the British Army, known from the name of the

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manufacturing firm as the "Carden Loyd Tankette," was a low, inconspicuous, lightly armoured machine, armed with one machine-gun; but though it was quite capable of doing what was required of it as an auxiliary arm for the infantry, it is not up to its duties as a scout for the much faster and more heavily armoured medium tanks. For this purpose a new light tank had to be designed.

In 1931, the first vehicle of this kind, known as the "Vickers Light Tank," appeared in the field. It weighed about 6 tons, had the high speed of 30 m.p.h. on the road, could cross a 4-foot trench, and had a reasonably small petrol consumption and a wide radius of action. Its turret provided for all-round fire from its one machine-gun and it had good armoured protection against bullets. But here again the curious exigencies of Treasury finance saddled the Army with a machine which was not really suitable for the work it was to be called on to do. In the year it was produced there were funds available to pay for it, but it had not yet gone satisfactorily through all its tests; however, as no guarantee could be given that if its construction were further postponed till these were finished, the money would not by then have been diverted to something else, it was decided that the chance must not be let slip, so the first type was forthwith built and issued to the R.T.C.

Shortly afterwards, the great progress made in wireless enabled radio telephone sets of a reasonably reliable and efficient pattern to be installed in all tanks, medium and light alike. This at once

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doubled the work of the unfortunate light tank gunner, who would already be fully employed in action in reconnoitring for the enemy, directing the driver where to go and what to do, and loading and firing his machine-gun. It became clear—indeed, the R.T.C. staff had always maintained—that the command of a tank, even a light tank, was a full-time job for one man, driving it for another, and firing its weapon for a third, and that the only really efficient light tank must be a three-man machine. It was therefore decided to replace the older pattern of light tank with three-man vehicles as they became obsolescent, and this policy is now being pursued as time and money permit. The disadvantage is, of course, that the latest light tanks in no way resemble the small, nippy, inconspicuous, cheap machines of the initial conception. On the contrary, they have to be large, heavy, and expensive if they are to be up to the work for which they were designed. All in all, however, it may be said that in this particular sphere of tank warfare the British Army has successfully regained the premier position it had won for itself by the end of the Great War and then lost awhile, and that to-day our light tank is the best of its kind in the world.

The only other form of British tank that requires mention here is what is known as the "close support" tank. The purpose of this machine is to accompany or follow the fleet of machines into action and assist them to deal with hostile anti-tank weapons. They are, in actual fact, nothing more than medium tanks, armed as their principal

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weapon, not with the coaxially-mounted gun and machine-gun as carried in the turret of the bulk of the mediums, but with a short-range mortar firing a heavier shell and a tube for discharging smoke. These are used to blind or blot out an enemy anti-tank gun as soon as spotted, before it can do much damage.

Tank development in the twenty years since the Great War has resulted then in the British Royal Tank Corps to-day being armed with the following machines :

- (1) A fully up-to-date and highly-efficient light tank.
- (2) A medium tank no longer up to its work, or fit to take the field in modern war.
- (3) A moderately efficient close-support tank.

Our antiquated tanks will very shortly be withdrawn from service and replaced by more modern and much improved vehicles. A new heavy "infantry" tank is also in course of production and should soon make its appearance. But not until both have been issued and the personnel of the corps have learned how to handle them can the British Army be regarded as fit to take part in a modern mechanised warfare.

Up to the present we have done no more than briefly mention armoured cars. A large number of these, mostly extemporised and of many different types, were employed on all fronts during the War ; the armoured car battalion that formed part of the Tank Corps performed

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admirable service in the final offensive in the West ; and in the Middle Eastern theatres, both during the operations against the Turks and throughout the subsequent prolonged disturbances after the Armistice, smaller units of these useful vehicles acquitted themselves with equal credit. For many years the armoured car was the only fighting vehicle for which the Indian Army authorities could foresee any use, and all the R.T.C. companies in India were armed with it. Later some of them were re-equipped with light tanks. The first two British cavalry regiments to be mechanised were also given armoured cars, as were certain former Yeomanry units of the Territorial Army on their conversion to R.T.C. companies.

The latest vehicle with which armoured car units are armed is the Lanchester six-wheeler which, with its 40 h.p. engines, can do 45 m.p.h. on roads and 150 miles without a petrol refill. It carries a crew of four men, and has a machine-gun and anti-tank machine-gun coaxially mounted in its turret. Though an excellent machine of its kind for long distance road reconnaissance, its small capacity for cross-country work and the vulnerability of its pneumatic tyres—which can be made solid only at the price of seriously cutting down its road performance—detract much from its utility once close contact has been gained with the enemy. It is improbable that any more armoured-car units will be raised, and indeed all the cavalry regiments now in process of being converted from horses to vehicles are to be armed

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with light tanks, though in the opinion of many these are hardly ideal for cavalry work.

It must also be remembered in this connection that the policy of motorisation of all arms of the British Army—that is, its conversion into an army which can be completely carried on motor vehicles, not all of which, however, will be armoured—has definitely been decided on and is now in full swing. As regards our artillery, that is already almost fully motorised. The reorganised infantry is also in process of rapid conversion, and is now being equipped with a number of fast and inconspicuous armoured machine-gun carriers. Our cavalry, as we have seen, will soon have light tanks of the present, or some modified, type, plus a few armoured cars. But how long, even with the present re-armament boom, it will take the army to complete its conversion into a mechanised and motorised force is difficult to foresee. It must always be remembered, too, that it is not enough for our men to have up-to-date armoured equipment; they have also to learn how to use it, and that too is a matter of time. The end of our present military transition stage is therefore as yet nowhere in sight.

CHAPTER X

FOREIGN TANK DEVELOPMENT SINCE THE WAR

SINCE the War practically every civilised State, great or small, has added tanks to its army in as large numbers as it could afford to purchase or build. It would serve no useful purpose to give details here of the armoured fighting vehicles possessed by such countries as Albania, Esthonia, Siam, or Venezuela, which are not likely to play a prominent part in any future war and which model their tactical methods closely on those of their greater neighbours. But a brief sketch of the present tank armament of the six great military States is necessary before we can understand the tactical doctrines favoured by each, and proceed to forming our conclusion as to the probable future of tanks in war.

(i) *France*

The same tactical and technical trends that manifested themselves in France during the War have persisted throughout the subsequent twenty years of peace. Just as the victories of our own heavy tanks at Cambrai and Amiens have led us in this country until quite recently to concentrate on the heavier types and somewhat

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to neglect the lighter, so in France the disappointing results of her first essays with heavy machines, and the brilliant successes of her little mosquito tanks in 1918, have established the latter type in general favour. And, indeed, the present French light tank, the Renault 35, is only the latest and most up-to-date of a long succession of models, designed and built by the same firm as was responsible for the original wartime machine, and bears a striking family resemblance to it in general outline and dimensions. This latest Renault is a two-man vehicle, weighing about 8 tons, and for a light tank is unusually heavily armoured. It has a fair speed, up to 12 miles an hour only, though an older model, fitted with thick rubber instead of metal tracks, could manage over 20 ; but, as we shall see when we come to discuss French tactical ideas as to the use of tanks, this low speed, for a machine which is intended mainly to work in close conjunction with infantry, is not considered a serious disadvantage. It is armed either with a light anti-tank gun or with a machine-gun, fitted in an all-round turret above the main frame, and retains the squat inconspicuousness, the handiness and nippiness, and it must be added, the limited obstacle-crossing capacity of its wartime ancestors. Recently the French have adopted another make of light tank, the Hotchkiss 35, with much the same specification and performance as the Renault of the same date. These two light tank models make up the main tank strength of the French Army, which possesses many hundreds of them.

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Within the last few years, however, the view has grown that something larger and more powerful than these little mosquito vehicles will be needed, if only to cope with the larger tanks of possible enemies. An 11-ton medium tank ("D.I.") has therefore been introduced; well armoured, carrying a crew of three men, and armed with a light gun and two machine-guns, and with a speed of over 10 miles per hour, it is a modernised and more solid, if somewhat slower, edition of our own Vickers medium, but without its main defects of too thin armour and poor internal arrangements for handling and control. There is also in existence an even heavier and more formidable heavy tank, made by the St. Chamond firm—a large 30-ton machine with very thick armour, carrying two guns and two machine-guns, yet nearly twice as fast as the "D.I." This powerful fighting vehicle, the latest and one of the best of its kind in the world, puts the French Army well ahead of any of its possible European rivals in the matter of heavy tanks, as the numbers and efficiency of its little Renaults have already done as regards light tanks.

France also possesses two good and up-to-date types of armoured car, made by the Berliet firm. These include both four-wheeled and six-wheeled vehicles, the latter of course slower, but with better cross-country capacity. Both types have road speeds of over 40 miles an hour, a wide radius of action on one fill of petrol, and reasonably good armoured protection.

(ii) *Russia*

France's ally, Russia, possesses the second largest and most up-to-date tank force in the world to-day. Like her ally, she has concentrated mainly on fast tanks, for mobile warfare purposes, of which she has several types, mostly of foreign design but home built. Two of these, the "Vickers T. 26" and "Carden Loyd Mark V," are of British make. Another pattern of light tank, the "Mali Sovietski," is a Russian adaptation of the French Renault, which it closely resembles in appearance, equipment and performance; and the latest medium tank, the Christie, is an American machine. The Red Army has thus borrowed widely, and apparently wisely, from the world at large in the interests of its Tank Corps.

Details and performances of most of their machines have already been given. The "Vickers T. 26" is a 7-ton vehicle, armed with a light gun and a machine-gun; fast and lightly armoured, it has a speed of over 20 miles an hour and is a very workmanlike and reliable little machine. The "Carden Loyd Mark VI" is, of course, an exact copy of our own model and has been adapted so as to enable it to enter and swim over rivers—a matter to which the Russian military authorities have always attached great importance.

The latest and most powerful of the Soviet tanks, the "T. 28," is home designed and built and is almost an identical copy of our own 16-ton tank, but with heavier armour and a more powerful engine.

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Another Russian tank is the new 8-ton Christie, which is really an eight-wheeled armoured car convertible into a tank by fitting an adjustable track. On wheels it has a speed of 70 miles an hour and on tracks of close on 50 miles an hour. It carries a light gun and a machine-gun coaxially mounted in an all-round turret, and carries a crew of three. Unfortunately it appears to be unduly subject to heavy wear and tear with heavy use—so much so that Russia has decided to construct no more tanks of this design.

Besides the Christie, Russia has a large number of armoured cars of various types, including a new Ford 10-ton six-wheeler with an 85 h.p. engine and a speed of 40 miles an hour, which is designed as an amphibious vehicle and is said to have given an excellent performance on test. It has a crew of four men, and carries a light gun and a heavy and a light machine-gun.

There is no doubt that the Soviet Tank Corps is numerous, formidable, and up to date. It is the only one so far that has yet paid serious attention to making its vehicles capable of crossing the water obstacles which are certain, in any future war, to be much sought after by the defence as security against attack by armoured fighting vehicles. But victory in the tank warfare of to-morrow may well fall, not necessarily to the army which has the most formidable first line strength, but to that which is able to maintain or even increase it as the war goes on. Great as Soviet Russia's industrial progress has undoubtedly been under her various Five Year

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Plans, it is doubtful whether she yet has, or will have for some time to come, the capacity to do this. There is a good deal of impartial but disturbing evidence tending to show that this industrial progress has been rather superficial than radical, and that her manufacturing and munitions resources might find themselves strained beyond their somewhat limited efficiency and capacity by the exigencies of a prolonged and intensive campaign.

(iii) *Italy*

The Italian Army since Signor Mussolini's advent to power has paid great attention to questions of mechanisation. But it can hardly be said that its present Tank Corps is fully up to date. Italy's light tank, the Fiat Ansaldo, is a 3-ton machine with a speed of 25 miles an hour; it carries a crew of two, and one machine-gun, and though a useful little machine for general purposes, has been found to show considerable defects as a fighting vehicle, both in Abyssinia and in Spain. Italy is now, however, experimenting with a new type of tank altogether, known as a "tank destroyer"; this, also a Fiat Ansaldo product, is a 5-ton vehicle, carrying a single anti-tank gun, and has a speed of 20 miles an hour, and its purpose is to lie in wait for and take on more powerful enemy tanks at close range, or move rapidly to meet and repel any massed hostile tank attack which has broken through the defensive front of stationary anti-tank guns. In addition, Italy is also building

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various types of mobile equipment for flame throwing, smoke producing and bridge building purposes, consisting of normal pattern light tanks with special trailers.

The Italian Army has no heavy machines, and up to a quite recent date its only medium machine was slow and obsolescent. A new 12-ton tank carrying a light gun and two machine-guns is now on order; it is designed for a speed of 20 miles an hour on roads and across country, and a radius of action of 80 miles on one refill. With its up-to-date fighting lay-out and good performance, this should prove a highly efficient weapon.

More attention in the past appears to have been paid in Italy to armoured cars than to tanks. Notable among the various types were the curious, spidery-looking Pavesi vehicles, with their separately articulated wheels which could adapt themselves to the most rugged and uneven ground. The latest Italian armoured cars, one of which is amphibious, conform more to normal pattern, with their fully bullet-proof armour, their powerful armament of gun and twin machine-guns, and speeds of 45 miles an hour on roads and 25 across country. They are six-wheelers and are manned by a crew of five men.

The Italian Tank Corps, though at present well behind those of France and Russia, alike in the numbers and the efficiency of its vehicles, is a *corps d'élite* and full of zeal and enthusiasm, and when its long overdue re-equipment is completed, will once again be in the first rank.

(iv) *Germany*

Germany had, it will be remembered, a late start in tank competition as, under the terms of the Treaty of Versailles, she was forbidden to build or possess any of these war machines. Before the advent of Herr Hitler to power, therefore, she was only able to carry out mechanised warfare training with the aid of "mock-up" tank bodies made of wood and canvas and carried on ordinary civil cars. Within the last few years, however, having shaken off the shackles of the Treaty, she has been building tanks at intensive speed. Her policy hitherto has been to concentrate principally on light types, and her first model, a fast 4-ton two-man machine armed with two machine-guns, has already had an extensive practical test in the Spanish Civil War—not, apparently, with very satisfactory results, since a new and smaller 2-ton model, with a speed of 25 miles per hour, is shortly to replace it. Quite recently this light type has been supplemented by two medium ones; one of 8 tons, armed with a light gun and a machine-gun, and a 12-tonner mounting a small howitzer or mortar, presumably for close support work. When the present tank construction programme is completed, the German Army will have 1,200 to 1,500 tanks of all types.

The mechanised infantry units of the army also have two types of armoured cars—a light four-wheeler of some 3 tons, armed with a light

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machine-gun, and an 8-ton six-wheeler with a small gun and a machine-gun for armament.

Thus Germany is fast making up her many years lost leeway in mechanised warfare, and though much remains to be done, must already be seriously reckoned with in this respect.

(v) *Japan*

Although few details are available as to the work and achievements of Japan's Tank Corps, in her Far Eastern campaigns of the last decade, she is known to have had a large and up-to-date fleet of machines of all kinds. Her standard light tank is modelled closely on the French Renault, the engine of which, however, having been found to be under-powered for the work required of it in the hilly country of North China, has been replaced by a larger pattern of home manufacture. This change has led to an increase in the total weight of the machine to over 9 tons, which, strictly speaking, would bring it almost into the medium tank category. A proportion of these light machines are said to be amphibious.

Japan also possesses a number of modern medium tanks. Her first vehicles of this category were British-built Vickers, but again these were found to be under-engined when subjected to the test of active service, and the latest type, a big and powerful 4-tonner with guns and machine-gun mounted coaxially in the turret and a second machine-gun mounted forward in the hull, has an excellent cross-country capacity and a speed of 30 miles an hour on the road.

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A novel type of machine possessed only by the Japanese Army is a mechanical land mine-sweeper, operated without a crew by wireless, and designed to precede attacking tanks over a suspected minefield area. Nothing is known as to its use or effectiveness in actual practice.

The latest pattern of Japanese armoured car, the Sumida six-wheeler, with adjustable track for cross-country work, is a powerful, well-protected machine of normal type, with a wheel speed of over 40 miles an hour and a track speed of 25 miles an hour.

It is unfortunate that we know so little as to the action in the field of these modern Japanese tanks and armoured cars, for they are said to have played an important part in Manchuria and Jehol, and are presumably also doing so in the longer campaign now in progress in North and Mid-China. Such information would certainly teach us many valuable lessons as to the present trends and future possibilities of tank warfare.

(vi) *United States*

The last army with which we need concern ourselves here is that of the United States of America. As has been already stated, the United States was not able to produce any home-built tanks before the end of the War, and those that her Tank Corps used were all French light Renaults or British mediums and heavies. Up to some fifteen years after the Armistice, though a large number of experimental models of all types were

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produced, the main United States tank armament continued to be of wartime pattern and for the most part of wartime construction. Finally a light tank, closely resembling the British Vickers, was decided on as the standard pattern, and the latest model of this category, a 7-ton machine, carries a crew of four, is armed with one anti-tank and two light machine-guns, and is designed for the high speed of 50 miles an hour—an exceptionally fast, powerful and formidable specimen of its kind. There is a smaller edition, lighter and more flimsily armoured, with an armament of three machine-guns.

Another type of American medium tank is a fast 11-ton vehicle carrying a light gun, an anti-tank machine-gun, and two light machine-guns. Only moderately armoured, its chief characteristic is its great speed—68 miles an hour on wheels and some 40 on tracks being claimed for them. It is of the Christie type, and though highly efficient when new, tends to suffer heavily from wear and tear in an unusually early stage in its life.

The present standard armoured car of the United States Army carries a heavy anti-tank machine-gun and a light machine-gun, which can also be used on a special mounting for anti-aircraft firing, and has a speed of only 30 miles an hour on wheels and 20 on tracks—very low for an armoured car to-day.

CHAPTER XI

GENERAL TREND OF POST-WAR TANK DEVELOPMENT

SUMMING up the general trend of post-war tank development, then, we see that the three categories of machine produced during the years 1916-1918 still exist to-day in improved forms. Those three categories, invented and developed during those years to solve the problem of the offensive in position warfare and semi-open warfare, have now been adapted to the purposes of the war of movement, which most military theorists and General Staffs foresee—or perhaps one should more accurately say, hope for—in any future conflict.

The progress made in the latest machines as compared with their wartime predecessors, may be summed up as follows :

(i) Their maximum cross-country *speed* has increased from some 10 miles an hour to some 30 miles an hour.

(ii) Their maximum *radius of action* (*i.e.* the distance that can be covered on one fill of petrol) has increased from 15 to 125 miles.

(iii) Maximum *armoured protection* has increased from half an inch to over an inch and a half thickness.

These are rough average figures only ; many

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of the most recent models show even larger and more striking increases, as will be seen by reference to the two previous chapters, but the above may be taken as a fairly accurate general statement of the progress made in all the armies of the great Powers.

As regards armament, it is more difficult to put the progress in general terms. On a purely numerical standard, the wartime tanks carried as many guns as those of to-day, in many cases more ; thus the British heavy tank had two 6-pdr. guns and four machine-guns ; its present-day successor has a 3-pdr. gun and three machine-guns. But the efficiency of the weapons, in such matters as accuracy, layout and arc of fire, has been greatly improved, so that it may be said that despite the smaller weight of armament, considerably increased fighting efficiency has been secured—a great advantage, as we shall see when we come to discuss the general problem of tank design.

The existing categories of present-day tanks, with their specifications, may therefore be summarised as follows :

(i) *The light tank*, weighing from 2 to 8 tons, has a crew of 2 or 3 men, has a speed of over 20 miles an hour, a radius of action of over 100 miles to one fill, and an armour thickness of over half an inch. Its armament consists either of a single anti-tank machine-gun or machine-gun, or in the latest models, of the two weapons coaxially mounted in a turret with an all-round traverse enabling fire to be delivered in any direction—to the front, flanks or rear.

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(ii) *The lighter type medium tank* weighs up to 18 tons and has a maximum speed of 30 miles an hour and a radius of action of 125 miles on one fill. It carries armour over an inch and a half thick and a crew of 5 to 6 men, and is armed with a light gun and a machine-gun coaxially mounted in the all-round turret and two machine-guns mounted in the hull or in smaller side turrets.

(iii) *The heavier type of medium tank*, for work with infantry, weighing up to 30 tons, has a speed of 15 miles an hour, a radius of action on one fill of 100 miles at most, and armour much thicker than that of the medium tank. Its armament comprises a light gun in the main turret and up to four machine-guns in smaller turrets.

To these three main categories of tanks existing in peacetime there would probably be added—in the event of a major European war—one of *super heavy tanks*, weighing anything up to 75 tons or more, with speeds of 8–10 miles an hour, and so heavily armoured as to be proof even against a direct hit from the projectiles fired by any existing anti-tank guns.

Generally speaking, then, it may be said that the typical post-war tanks of all categories are in every way a great improvement on their wartime ancestors—faster, better-protected, with greater endurance, and more effectively though less heavily armed.

Much consideration has also been given to the engineering problems of design and construction; not only are the vehicles, as such, easier to drive, steer, turn and brake, but their maintenance in

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good running order is simpler, they consume less petrol, lubricants and spare parts, their engines deliver more power for equal or less size and weight, and their springing and suspension have been vastly improved. In every way they are better machines in comparison with those of the Great War, just as the ordinary motor-car of 1938 is an improvement on the vehicle of 1914. If the advance has not perhaps been so great in proportion, this is due in the main to the peculiar technical conditions governing tank design, as to which a word must now be said.

In the production of any machine there are, under present-day industrial conditions, four main stages. The first stage, that of pure research, does not normally enter into the process of tank production and need not here concern us. It is only necessary for the military authorities to keep in touch with and watch the results of the progress of civilian research, so as to be sure that nothing that may turn out to be of possible military value escapes their notice.

Next comes the stage of applied research, that is, the application of knowledge to exploring the general possibilities of some new design, such as an entirely new type of engine or vehicle. This again will usually be the work of civil research bodies, with the military authorities holding a watching brief in all such fields as appear likely to be of use to them, as well as in any specially devoted to matters of military manufacture, such as guns, explosives, and tanks or other military vehicles.

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When applied research has done all it can to explore the general possibilities in its particular field, it abdicates the position of lead to the military authorities, who must now tell the designer and manufacturer broadly what their requirements are, so that the latter can go ahead with producing what is wanted. The more detailed this specification of requirements can be made, the easier and quicker will be the process of production, always provided that the military men do not demand impossibilities. This they can avoid if they have a clear knowledge of what is and what is not possible, and keep in close touch throughout with the executants of their specifications. As a rule, it is the best procedure for them to lay down only a few points as absolutely essential and state the rest in some sort of order of priority, for in a tank, as in a warship, or a railway engine, or indeed any form of mechanical product, one cannot have any one thing exactly as one would like without some compensating sacrifice of something else. If a tank, for instance, is to carry a certain minimum thickness of armour, speed will have to be sacrificed, because the engine can only move a certain weight at a given speed, and increased weight of armour, therefore, means a slower tank. If the tank be increased in size to allow of the fitting of a more powerful engine, that will make it more conspicuous and therefore easier for the enemy to see and hit, so that the increased thickness of armour may, by increasing the size of the enemy's target, have the ultimate effect of making the tank, not less,

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but more vulnerable to hostile fire. In tank design, therefore, as in other departments of life, the ideally best may often be the enemy of the practically good, and too meticulous a search for the former, if directed on wrong lines, may merely serve to defeat its own ends.

Once its specification has been decided on, the new machine is designed and produced, first as an experimental model which is thoroughly tested out under conditions as like those of actual war as possible. Here it will certainly develop a number of unexpected faults—only minor ones if the designer and manufacturer have done their work well. But some there will inevitably be, and these require to be rectified before the new product can be finally approved and issued to the army for general use. These rectifications in turn will usually have to be submitted to practical test. In fact, this process of trial and error and amendment goes on through the whole process of production. It cannot, moreover, be hurried over or short-circuited, save at the price of almost certain failure somewhere, and such failure will certainly be costly and in war may well be disastrous.

Finally comes the stage of mass production and issue of the machine in what for better or worse is its final form. Once produced and issued, it will normally remain, in peacetime at all events, a standard weapon until old age or obsolescence make it necessary for it to be replaced by something newer and more up to date.

Two points may well strike us as regards this production progress. The first is that, in peacetime no weapon can really be subjected to the critical and final test of its efficiency—the test of war itself. Military history is full of examples of devices and inventions from which much had been expected by the armies adopting or using them, only for disappointment and sometimes defeat to result. Often this was due to the faulty use of the weapon; the history of the first machine-guns is a case in point; that of the first tanks, already narrated here, is another. Often the fault has been in the weapon itself, which has developed unexpected and unforeseeable defects under the novel strain of war. History therefore warns us, when we try to foresee the possibilities, say, of our new tanks in future warfare, to allow a certain margin off their peacetime performances, for peace and war are far different tests of efficiency.

The second point is this. We have seen that all our present tanks are modelled on the specifications of the military authorities of the countries concerned; they are, in fact, an attempt to give the military authorities the tanks they want. Now in all walks of life, not only in the military sphere, what one wants depends on what one hopes and intends to do with it; one picks, or has made, the best tool to serve one's purpose. What do the military authorities of the various great Powers hope from, and intend to do with, their great tank fleets in any future war? What

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purposes have they been built to serve? In military language, what is the British, the French, the German, the Russian tank doctrine? These are the questions to which we must devote our attention in the next two chapters.

CHAPTER XII

BRITISH TANK DOCTRINE OF TO-DAY

THE last three chapters have necessarily been somewhat heavy going, for facts and figures are always dull though necessary things. But now that we must pass on to the tank doctrines of the various countries, as contained in their training regulations, we shall find the subject, if we are going to treat it in the manner of these regulations, even duller still. Fortunately, there is no need for us to endure this. Let us, as it were, go to sleep, powerfully assisted in the process, as we may well be, by a preliminary study of these training regulations, and see what visions of future battles come to us in dreams.

Here then, induced no doubt by our study of British tank thought, is our first "battle of a dream."

* * * * *

General Smith, the commander of the recently formed and newly armed 2nd British Mobile Division,¹ has had a difficult job given him by

¹ This consists entirely of mechanised or motorised troops, the fighting units comprising a tank brigade (one battalion of lights and three mixed battalions of lights and mediums), two brigades of mechanised cavalry (each of three light-tank regiments), an armoured car regiment, and motorised infantry, artillery, and engineers in proportion.

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the commander of the small British army which landed a few days ago on an undefended strip of the coast of Ruritania. The fighting part of the army has got ashore, but not its transport and impedimenta, and a strong Ruritanian force is known to be hurrying up hot foot from the south "to catch us," as the army commander put it to General Smith, "before we've got our bathing togs quite off, or our town suitings more than half on."

In the course of their subsequent talk, which we need not follow in detail, the Chief had given General Smith his orders.

"Get out in front and meet these birds and keep them off us here till we all get ashore—say for four days from now. Slow them up, worry them, hit them where you can—only don't get caught yourself and don't get cut up, because I shall want you and your people for a real job later."

This is the Division's second day out. Much has been happening, and much more is about to happen soon. Its co-operating air squadrons got sight of the Ruritanians yesterday—a whole division of them; they were then thirty miles off and advancing fast. They have not been keeping up that pace since; a little judicious machine-gunning from the air has helped to slow them up, but the main brake has been the activities of the Mobile Division.

The first of its ground troops to get touch with the enemy were the patrol cars of its armoured car regiment, which were speeding down all the roads to its front and wide to its flanks by breakfast-

time. The flank patrols had cast around widely but found nothing—it was useful to know that the lone Ruritanian division was the only one in the area at present, though there would certainly be others before long.

The forward patrol of the Division had soon run into the enemy. Some had bickered with them—hidden round corners, shot at their first troops as they came swinging or stealing round and then whipped off to play the same trick farther on. Some had lain up in woods or hollows off the roads, waiting for a chance to dash down a side road upon the flank of some unwary enemy column, or loose off a burst of fire into it at short range. The enemy had been worried all morning in this way, but by afternoon the game had become too dangerous, and the armoured cars had all been called in.

The light tanks of the two mechanised cavalry brigades, working one to the west and one to the east of the two roads by which the Ruritanians are pushing up to the north, had taken up the running in the afternoon and evening. They had made their presence felt all right! On the front and outer flanks of both the Ruritanian columns, these fast little machines had appeared at half-a-dozen places at once, shooting up a party at long range here, darting in for a quick volley and a scuttle back to cover there, lying hidden somewhere else until a good target offered itself, and then a burst of fire and away before the enemy could know where they were, much less catch them.

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By tea-time the Ruritanian commander had evidently concluded, as General Smith had meant him to conclude, that there was a formidable British tank force at large, somewhere just over the distant horizon, and that he might be attacked by it at any moment. He had therefore taken the best measures he could to secure his command's safety, while still continuing its advance.

A thick screen of anti-tank guns, of which the Ruritanians seemed to have plenty, had been put out in front; they moved forward in two halves, one half bounding up from one ridge to the next half a mile ahead, then waiting for the other to follow and take position to cover its next bound before it went forward again. Well behind, bunched close, each with half-a-dozen more reserve anti-tank guns at its head, came the two marching columns; each had a second screen of anti-tank guns moving along high ground on its outer flank, and half-a-dozen more bringing up its rear. The Ruritanian division, in fact, finished the day's march enclosed in a sort of moving anti-tank gun box; its rate of advance had been badly slowed up, and its gait had rather resembled that of a cat on hot bricks, but it had kept moving still, and settled down for the night in a densely wooded anti-tank area, with all the approaches well guarded.

General Smith might have been well satisfied with his division's first day's work if he had not been so preoccupied with something else that was just about to begin. The Ruritanian division had set out at blush of dawn in the same formation

as the day before ; little—he hoped !—did they suspect what was coming to them ! Just ahead of them now was a light tank screen, and behind some close-support tanks with smoke mortars, ready to put out a screen on the enemy front and right flank. Lying up in a wood away on that flank was the whole of the British Tank Brigade. As soon as the smoke screen came down, it was to issue forth and make for the enemy's rear. The light battalion would wheel up as soon as it got well behind the Ruritanian right column, to attract the attention of the bunch of anti-tank guns at its tail ; then the three medium battalions, two up in front and one in second line, swinging farther round still and then turning to head north, would break in and attack the right column from the west, when it had no protection screen out at all. A few guns left with the column itself might get into action, if they were lucky and quick, before the tanks' fire struck their crews down ; the rest of the force would be helpless before this attack from a totally unexpected direction, believed to be safe and secure.

General Smith had a vivid—perhaps a too vivid—imagination. He could see the picture now, as he sat in his headquarters car, parked on a village green, waiting for the first report of the attack—the sudden roar of a hundred engines—the sleet of bullets at short range—the rattle of the tracks of the oncoming tanks, the sun gleaming on their metal as they thundered forward—the bellowed orders of surprised officers hardly heard

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above the din—horses rearing and neighing, men falling—groans, cries, panic. . . .

“ Beg pardon, sir—your tea, sir ! ”

The General yawned, rolled over and opened a sleepy eye on the unlovely barracks of dear, dirty old Tidworth.

* * * * *

General Brown's 2nd British Tank Brigade forms part of the Expeditionary Force sent across Channel to co-operate with the Neustrian Army in its duel with the larger and more formidable forces of her eastern neighbour, Austrasia. The fortified barrier guarding her eastern frontier had caved in before the first Austrasian attack, but the exploiting force, fanning out in pursuit through the gap, has been checked and thrown on the defensive. It is now standing to fight on a thirty-mile front, and though its flanks are open, it is known that Austrasian reinforcements are hurrying forward to prolong them on either side, so as to form a huge, hostile peninsula, jutting right out in the heart of Neustria—a most awkward and undesirable situation for that country. The Neustrian Commander-in-Chief, with the full approval of the General commanding the British Expeditionary Force, has determined to attack at once, before these enemy reinforcements can put in an appearance. A frontal attack alone would certainly be slow and possibly unsuccessful; he has decided, again with the hearty concurrence of his British colleague, to use the British Tank Brigade to press round the enemy's flank and

break suddenly into their rear by surprise, while the main body of the Allied armies presses hard and heavily on their front.

So far—it is very early on the morning of the second day of the battle—the move seems, General Brown thinks, to have gone well. During the last two nights the Tank Brigade has been moving from one concealed area well behind the Allied lines, by way of a second one far out to their flank, to a third one within striking distance of the rear of the enemy's front. Here they all are—the light battalion and the three mixed battalions of the brigade—ready to strike out, as soon as it is light enough to see, against the area up on the plateau ten miles off to the east, where the right flank of the Austrasian gun line rests. General Brown has been fully informed by air reconnaissance of their dispositions here, of which the most interesting, from his point of view, is that the area is guarded by a wide semicircle of anti-tank guns, five miles from end to end, against any attack from north-west, west or south-west.

"A nasty looking nut to crack, sir," respectfully remarks Colonel Harris, commanding the 12th Battalion, as the four colonels and the General bend together over the lantern-lit map laid out on an improvised table amid the trees screening the halted Brigade from prying airmen.

"Oh, not too bad, Harris, surely. We've often tried it before on the Plain. Now we've got to put into practice what we learnt there."

"What's the programme, sir?" asks Colonel James, the 13th Battalion commander.

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"Quite simple ; quite normal—nothing new. Maxwell, your lights will go ahead and get up as close as you can to the north tip of this anti-tank gun line. Then halt and wait for me there to come and have a look-see. Wilson," to the 14th Battalion commander, "you'll come up with me, so stand by for a call. So far as I can foresee, I shall want to use your lot for a diversion to mop up the north part of the screen. If there's a way in to its rear, round by the north here, you'll take that, and run right along to the south behind it. Send your mediums by companies to smash back through the line from behind, one by one, and use your lights for a frontal diversion if you can get them there. It'll all want rather careful timing, if you aren't to get rather heavily hammered, but. . . ."

"I can manage it all right, sir," says Colonel Wilson, confidently. "Anyhow, it's really only a cover for the real push, I take it, so it doesn't matter if we do get hotted up."

"I'd rather you didn't, but of course you're right. Harris, James, you'll go for the real target—the mass of the Austrasian guns. Maxwell will go ahead of you, and I want a heavy smoke cloud put down all along our south flank as we go, so as to prevent any interference from that side from any anti-tank guns Wilson can't or doesn't mop up. All three battalions will drive due east straight for the batteries ; go all out as far as that line," the General scores with his fingernail a railway line, running for the most part in a cutting several miles away to the east of their

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wood—"and then, I expect, swing south to rally in that valley here—don't forget to piquet it, first man to get there. But I'll let you know that by wireless later. All clear? No questions?"

"No, sir," "O.K., sir," "I understand, sir," "Quite clear, sir," comes the chorus of replies.

"You see, gentlemen," says the General, suddenly beginning, he could not himself quite make out why, to embark on a tactical lecture, which he can see by his subordinates' faces they feel to be quite unnecessary, "the idea in all these sort of jobs must be to approach from an unexpected quarter, so that the anti-tank guns have to shift and show themselves—make the main attack at one place after feinting at another—put only just what we can spare against the enemy anti-tank guns lying doggo for us, and all we've got else against the enemy artillery they're covering. The artillery, that's our real objective, that's the mainstay of their defence; and once it's out of the way there'll be nothing much to stop our frontal attack getting to grips with them. . . ."

And then, just as he is wondering how on earth he is to get out of this interminable and somewhat ungrammatical sentence, he suddenly finds his young and pretty wife's face gazing disdainfully at him from her pillow.

"If I'd known," she said, "you talked in your sleep as well as snored. . . ."

* * * * *

Colonel Jones, commanding the 9th Army Tank Battalion, co-operating with the 9th Division of

the British Expeditionary Force in Neustria, was watching his big infantry machines just lumbering forward to the frontal attack of the Austrasian defensive position. They had come up last night under cover of a couple of air squadrons droning noisily overhead to cover the rattle of their tracks and the hum and splutter of their engines, and had lain up in a fold of the ground half a mile back from the British outposts till just before the break of day. Now they were off.

Colonel Jones was not an easy man to please, but he thought that on the whole the arrangements he, and all those concerned, had made for the attack had been reasonably complete. A mass of artillery was backing him up—the opening of the barrage a few seconds ago had almost deafened him with its din, and surprised him, as he watched the shells fall, by its accuracy and density; he was particularly gratified with the smoke screen he had asked the chief gunner, somewhat to the latter's surprise, to put down on the left of his tanks—if the Austrasians hadn't got a pocket of their big anti-tank guns there, even though the air photos had shown no sign of it, they weren't the soldiers he'd always taken them to be! But now, even if the guns were there, they'd see nothing to fire at until his tanks had got safely by, and the accompanying infantry following close behind ought to be on to them and gobble them before they had time to do any damage.

On the whole, the attack seemed to be going well; all along the mile of front his battalion was covering, tanks were going forward, quartering to

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and fro, over the ground, lumbering off at a tangent to deal with some well-hidden enemy machine-gun nest that had suddenly come to desperate and hopeless life, or nosing along a hedge or ditch that looked as if it might, or ought to, hold a few low-lying riflemen. The infantry were keeping up excellently—so they should, for this sort of combined attack had been practised time and time again by both arms together, and everything that could be arranged beforehand had been fixed up and laid down in orders—how far the tanks should go in each short bound, before they halted to let the slower infantry finish mopping up all the ground behind that they had just overrun, and come up level with them—how each arm should let the other know it was in momentary difficulties and ask for help—the general timing of the whole attack—all these points had been dealt with and all concerned knew all about them. If anything unforeseen should happen, he himself was in close touch with the brigadier in command of the attack in this sector, and he still had a company of his own tanks in reserve, and its major squatting on the turret roof of his command tank just outside, watching and waiting for any emergency and any orders.

Hullo! there was a bit of trouble over there! One tank suddenly stopped—another one on fire too! Where was the anti-tank gun? Ah! there it was—spotted its flash—but had the rest of the stricken tank section seen it? He couldn't be sure—they were banging off more or less in its direction, but, he thought, only at random in a

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spasm of optimism. But it seemed to have shut down all of a sudden—Ah yes, that was why! A stalking knot of infantry had risen up within a few yards of it—out of the earth, it seemed; there were some puffs of smoke—bombs, he supposed—and a few prostrate figures round a wrecked gun were all that was left of piece and crew. Good work!

Everywhere else the attack was proceeding unchecked. Away to the far left there had been a pause for a few moments, when one section had—quite rightly—fought shy of a nasty-looking exposed sky line and had to look for a way round. But the British machine-gun barrage, which could drop its fire right among the tanks without any danger to their ironclad sides, must have accounted for any enemy there had been, for the second wave and the following infantry had swept over the crest quite unharmed.

So far as he could see, in fact, it was all over, bar the shouting. The leading tanks were up, or almost up, to their final objective—that long, hog-backed wooded ridge in the middle distance—all along the allotted mile of front. In ten minutes—well, say fifteen at most—the foremost infantry would be up too, and the tanks could rally back under cover half a mile down the slope. Other troops were to take up the attack from there on, but that, thank the Lord, was not his job. However, he ought, he supposed, to move his reserve company a bit farther up, and go up with it just in case. . . .

He poked his head through the manhole in the

turret to pass the word to the major sitting just above him, and found himself, to his bewilderment, looking into the large, soulful eyes of his cocker spaniel which was lying—as usual—full stretch on the bed by his left shoulder.

“A dream, old boy!” he yawned sleepily, “a damned fine dream too, but only a dream.”

* * * * *

General Sir William Robinson, K.C.B. (just decorated at Buckingham Palace that day) was meditating, as he sipped his vintage port, on the victorious campaign just concluded, which had won him his knighthood and modicum of fame.

His view, perhaps an unduly modest one, was that he didn't really deserve it. The little tribe of Arabs that he had just so swiftly and painlessly reduced to begging for terms would have given a capful of trouble thirty years ago, but now, what with the air, and tanks, and all that—they hadn't had even a dog's chance. They had no anti-aircraft guns and no anti-tank guns, of course, but they could—in fact, often had—put up a sturdy resistance against infantry and artillery, even in pretty considerable numbers, in their home country, and always made such thorough nuisances of themselves on our long lines of communication, that before we could really get at them we had been compelled to scatter as many troops along it to defend it as we had in the striking forces up in front. Last time we had even had to build a railway and run a pipe-line up—Lord knew at what cost!

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This show of his, just over, must have come as a nasty surprise to them ! He had asked only for three air squadrons, a mixed and a light tank battalion, a mechanised artillery brigade, and a brigade of motorised infantry. He knew the ground was good enough to use these almost anywhere, but his idea had been not to fight and kill Arabs, but to bring them cheaply and quickly to terms. And he had done it—so neatly and easily and rapidly that he doubted if there would be any more trouble there while there were any Arabs left alive and old enough to remember it.

It had been quite simple. The air and the ground troops had worked together all the time. There were very few areas where the enemy could lie up without being found and made highly uncomfortable by the air. When they had managed to hide, the motorised infantry had been set to dig them out, and when they broke out of their covert they had had both the air force and the tanks to deal with, and they were helpless before either of them ; they had been kept on the run, chivvied from pillar to post, shedding footsore and disheartened warriors every mile or so, until at last they had come to a standstill and let themselves be quietly surrounded and offered good terms of surrender. They had, of course, tried their old game of getting at our lines of communication, only to find to their surprise and dismay that there were none to be got at. Everything we wanted for the first hundred miles or so of the advance had gone with us in lorries, and from the time those ran empty we had been

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supplied by air—50 tons of stuff of all kinds in twice-daily trips of one of the bomber squadrons, delivered just when and where required. No wonder when the Arabs had found all their aces being trumped they had thrown their hand in. But without land and air mechanisation, they'd still have been as awkward to tackle as ever—and he'd probably now be a plain colonel on half-pay, with no prospects. . . .

"Please, sir," said the maid, opening the study door, "the Vicar has called."

* * * * *

British tank doctrine of to-day, it will be seen, envisages two possible forms of employment of the arm in the offensive. (a) Tank brigades, acting independently, may be used to strike the enemy in flank, to assail his reserve in movement so as to prevent their intervening in the battle ; or to break into and sow confusion among his gun positions and headquarters and supply organisation, so as to assist the forces simultaneously carrying out the forward attack. If there is already an open flank, such missions can be carried out by means of a wide turning movement, executed swiftly and coming as a surprise to the enemy ; if no such flank, exists, the tank brigades can be employed in these independent rôles only after a gap for them to pass through has been made in the enemy line by a frontal attack carried out by the other arms. In pursuit, of course, tank brigades will find a wide scope of useful and indeed invaluable service. It will be

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seen how closely these ideas as to the future employment of independent tank brigades are modelled on the Plan 1919 already described.

(b) Army tank battalions will be used in the initial stages of a frontal attack on an enemy position to break through his forward defences, or in the later stages to confirm or extend success already gained. Concealment of their approach, full support by artillery and machine-guns, close co-operation with infantry, who must follow them up closely and take over from them quickly, so as to avoid the necessity of exposing them too long to hostile fire while holding on to the captured position, quick rallying and re-organisation—all these will be necessary if the attack is to go through to success quickly, cheaply and with certainty.

In the defence tanks will be used mainly for counter-attack purposes, particularly against enemy tanks which have broken into or through the forward positions. They will also be called on to play a leading rôle in the large-scale counter offensive, which should in theory be the crown and completion of every successful defensive battle, to inflict a decisive defeat on the shattered and staggering assailant. In this case again surprise and swiftness will be the keys to success. It is perhaps a fair criticism of present-day British tank doctrine to say that it gives insufficient weight to the high value of the tank as a defensive weapon—in which rôle, it may well be even more formidable and potent than in the offensive.

* * * * *

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“Your young men shall see visions and your old men shall dream dreams.” These visions may be said to be those of the young men who are now rising to the higher ranks of the British Army. But no one can touch even briefly on British tank doctrine without some mention of the dreams of one older man, without whom we should probably have had neither tanks nor a doctrine for them to-day.

General Fuller, whose name has already occurred more than once in these pages, though not yet an old man, even less so in intellect than in years, has been, ever since the tank's first appearance, its most potent and prolific advocate. He may be described as a military H. G. Wells, so active in mind, so fertile in thought, so tireless of pen, as to make it difficult for the more pedestrian and less single-minded to keep pace with him. Sometimes, indeed, like Mr. Wells, he seems to be finding a new and fairer military Utopia every day, leaving the path behind him littered with outworn and discarded dreams. Many of his claims on behalf of the possibilities of the tank, even to-day, may appear extravagant and even absurd—though many, since fulfilled in fact, appeared no less so when he first put them forward. Many, as he has frankly admitted, were of set purpose exaggerated for advertisement and publicity purposes; for just after the War, when the British Army was being remodelled for the expected long era of peace, the Tank Corps, despite its pre-eminent achievements, was in dire peril of total abolition, and only advertisement

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and publicity availed to save it alive. But General Fuller still has, and still propagates, his visions of the future of the tank in war, which no writer on the subject can or dare neglect.

He sees the armies of the future, small, professional, fully mobile, highly trained and skilled, divided into two parts with separate yet joint functions. The non-tank arms will form mobile anti-tank forts, supplied by fast-moving armoured convoys from the rear, or by air ; they will advance into and establish themselves solidly in the hostile territory to serve as jumping off and rallying places for the tank fleets and the air squadrons which will range far afield to seek out and destroy the enemy. Infantry, cavalry, and artillery—all the old arms, all the old mechanism of war as we know it to-day and as our forefathers for centuries back have known it, will henceforth be outworn and demoded. These new model armies, children of the aeroplane and the tank, will wage a new form of war—a war not of lines and positions, but of areas, where attack may be delivered from, and defence must guard, any and every side—from the air above, from front, flank or rear ; where nothing is impossible and nothing too bold to attempt or achieve. In these new armies waging their new war, every officer must be a skilled artist, every soldier a craftsman, and the general a man of scientific genius for war. Can such be found, and where is he that shall find them ? Perhaps only a scientific genius of government can ensure us a supply of scientific genius of war—and perhaps such a genius might come to the

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conclusion that war itself is really a wasteful and ineffective method of settling human differences, and lead the world away from it to a more perfect peace. And perhaps not.

But although it may be true that in the post-war years the British Army has had more tank literature than tanks, though our machines to-day are not by far what they might be, and should be, and will be, much has been done to render possible the translation into the solid fact of achievement, if and when the necessity should come, of these doctrinal dreams. In its solitary Tank Brigade, thanks to the work of a succession of brilliant brigadiers, the British Army has the finest, most supple, and most formidable fighting weapon in the world to-day. In tank construction we have lost our first wartime supremacy ; we shall regain it. In the thought, doctrine, and practice of tank warfare we still maintain that supremacy. We must not and shall not lose it.

CHAPTER XIII

FOREIGN TANK DOCTRINE OF TO-DAY

AFTER our somewhat prolonged inquiry into British tank warfare ideas, we must cast a glance at those of other armies. But whereas, partly owing to the greater variety of wars in which the British army may at any time be engaged, partly owing to the lead it still holds in tank thought, it seemed advisable to describe four different British visions, we need not allot to other people's ideas so much space. European soldiers' dreams are chiefly concerned with a war in Europe, with the play of vast armies in their well-roaded, well-railwayed frontier lands ; they have their colonial wars too, but in these the burden and heat of the day is usually borne by their special colonial regiments. We shall therefore confine ourselves, in what follows, to the actions of a formation, engaged with other formations on either side of it, in a great frontier battle of some future European war.

(i) *France*

General de Miremont, commanding the 394th Division d'Infanterie of the 132nd French Corps d'Armée was an old and tried veteran who for years had thought, and lived, and dreamed for

this hour. Yet he was anxious—as anxious as the mother of a debutante daughter at her first coming-out party, or as an actor about to play, after weeks of rehearsal, a part that he knew by heart and believed to be good. So the General now, in the last minutes before his division, attacking in conjunction with a score or more other divisions all along a line stretching far away to its right and equally far away to its left, was due to jump off, allowed himself for a moment to wonder whether everything would really go just as had been foreseen and believed. It had not been so, he reflected uncomfortably, in his subaltern days in August, 1914.

In his mind's eye he ran hurriedly through his orders and dispositions—it was far too late to change them now, but he wanted to be sure in his own mind that he had forgotten nothing. He bent over his large-scale map, with its multiplicity of coloured pencil markings. Here, along this part of the north and south blue line, compartmented off by yellow east and west lines into a series of divisional sectors, was his division's piece of front—a bare half-mile from flank to flank. Now that he had been specially strengthened by all that weight of army tanks and heavy artillery, he had plenty of weight of force in that narrow space, surely! There on that high crest line, a mere 2,000 yards ahead to the east, was the division's goal—not far to go—a bare quarter of an hour's full speed dash for his fast tanks—not more than an hour even for infantry—unless. . . .

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But what could go wrong? Tanks, infantry, artillery, air force—they all knew just what to do, had practised it all hundreds of times at staff rides, field exercises, manœuvres—it must be second nature by now to every officer and man at this moment waiting, just as he was, for the fateful hour to strike. No one, of course, could be quite sure what the enemy might have in store for them; there was a minefield, but the slowly-rumbling artillery preparation, due to quicken in a few minutes now to its last brief half-hour of hurricane bombardment, had, if the reports that had reached him did not lie, already blasted that into a ruin. That last half-hour's drum fire could be relied on to put paid to all the hostile anti-tank guns that the air had been able to spot—and unless all the intelligence reports were wildly wrong, and the enemy was holding his line far more strongly than was believed, there were not many still left unaccounted for. The same with the enemy battery positions—practically all were known and all would be faithfully dealt with as soon as the "half-hour hell" began. No, the way for his tanks and infantry was clear; there was nothing ahead of them that they shouldn't be equal to dealing with.

First of all were to go the waves of fast tanks—those new machines of which so much was expected—ten waves of them, one following another every 200 yards, and well up with the later waves a good sprinkling of those heavies, each with its "soixante-quinze" field-gun, which could stand off at three-quarters of a mile or more from any

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anti-tank weapon left alive and blow it to hell at that range—too far for the anti-tank gun, to touch them through their thick hides.* If the enemy tanks, too, came back at the division half-way up to or on its objective, these were the things to teach them a lesson and send them back with sore heads.

Behind these machines and just ahead of the infantry would move the little light tanks, two waves of them, darting to and fro, forwards, sideways, sometimes backwards, as target or quarry showed itself, always on the move, yet never far away from their infantry, which in its turn was to jump off to follow them five minutes behind. By the time these latter, the most vulnerable part of the whole attack, emerged to do their part, not an enemy anywhere ought to be able to show his nose except at his dire peril. Ahead of the foremost tanks and on their flanks the guns would be dropping a continuous curtain of shells; all the area of attack, from objective back to starting line, should be swarming with tanks of all kinds; and up above the air's eyes will be watching and waiting. But until the infantry can get ahead to the final objective on that far ridge, he can't and won't feel content or secure; and of course they won't have quite a walk over—they'll have to fight part of the way—perhaps a good deal of it. But if the tanks have kept their eyes open all the time and done their job, the infantry should get there up to time, and then there might be a hole for the mechanised divisions to thrust through.

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The bombardment was swelling to a deafening roar—in an hour and a half, or two hours at most, he would know. . . .

But in an hour and a half, well awake but still rather worried, though about other things, he was actually consuming his hotel's somewhat inferior *petit déjeuner*.

(ii) *Germany*

The grey-uniformed orderly drew himself up stiff as a ramrod as he saluted.

"Message, Excellenz—urgent."

The General in command of the 1st Armoured Division tore open the wireless flimsy and rapidly read it, then swung on his farmhouse chair to his chief of staff. Exultation showed behind the mask of his usually impassive face.

"The Thirty-seventh Corps reports the bridge-head established., Mayer. Let them loose."

"Zu befehl, Excellenz."

Over the ridge, down to the river bridges, across and up the rise beyond, rolling, rattling, thundering, roaring, came line after line the mighty mechanism of the Armoured Division, the steel spearhead of Germany's new army. Leading the hunt came a swarm of the fast little four-tonners, going all out, leaping and bounding like greyhounds over the gently rolling land, their twin machine-guns jerking as they rose and fell; close behind the heavier eight-ton machines with their turret guns trained forward, commanders' heads—field-glasses to eyes—protruding out of the top manholes, intent on using to the full these last

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few moments before hostile fire should force them to close down. Among or slightly to the rear of them, already losing ground in the break-neck race, the heavy close-support machines, with their howitzers and mortars all set to open at the first sight of the foe, lumbered noisily along, and at sight of them the sappers at the bridges and the supports of the victorious infantry of the XXXVIIth Corps, whose success had opened to these brontosaurus of war the road to the enemy's sensitive back areas, waved their helmets and cheered themselves hoarse, though no sound of their voices could be heard above the deafening metallic din.

This first echelon, over a hundred tanks in all, was to drive right ahead, stopping for neither friend nor foe, making for the hostile headquarters and the reserves presumed to be grouped in their vicinity. In an hour it would be storming upon them, for what could stop in it? And once they had appeared, the enemy generals and their staffs would find themselves busy enough trying to save their own skins without attempting further to direct their losing battle, even if, with all wires to the front severed and wireless continuously jammed, they had any longer power to do so. The hostile reserves would be fortunate if they escaped being helplessly caught in the open and could find refuge in some tank-proof locality, from which they would certainly never dare to emerge until the wave of terror and destruction had passed on—and before long air bombs and shells and the motorised infantry following hard

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on the tanks' heels would come to seal their fate.

Hardly had the last machines of the first echelon cleared the bridges than a renewed clamour behind heralded the approach of the second. Down into the river valley it plunged, across the stream, and up the far rise, in the same formation as the first. The objective of these hundred and fifty tanks was the hostile gun area. The thunderous passage of the first wave must already have woefully disorganised and demoralised the batteries, and such resistance as they could put up to its successor, however stubborn and desperate, could hardly be more than brief and sporadic. The second wave, dust and fumes and a reek of petrol swirling in its wake, also passed by on its way to victory and glory.

As it vanished, the waiting infantry began to collect and form for advance. The third echelon, whose rumble could even now be heard approaching, had the special duty of dealing with the enemy infantry, and in this they themselves would have to co-operate. Not that they looked for much trouble from these sources; hammered ever since dawn by heavy shell-fire, blinded by smoke and the helmets which gas had forced them to wear for hours on end, and rained on by bombs and machine-gun bullets, their losses in men, machine-guns and anti-tank weapons must already have been heavy, even before the German infantry attack had come to thrust them back from the river and open the road for the two tank floods which had already gone storming over and through them. Now, without commanders to

direct them, guns to cover them, or reserves to come to their aid, what more could they do save fly—or die ?

The triumphant notes of the “ Horst Wessel Lied,” caught up by the clumps of forming infantry, soared up in the air for a few moments ere the clangour of steel and the pulsing of a hundred engines drowned them. . . .

The General sat up and rubbed his eyes. He must have dropped off to the drone of his own wireless. Herr Goebbels was still orating. .

(iii) *Russia*

Lieutenant Tambovski, already weary of his long train journey to the south from Moscow, where he had just finished a war course, had fallen to whiling away his time by running over some of the points he had learned about tank warfare.

“ Let’s see,” he said, “ how much I remember. Tanks will normally be allotted in the ratio of one battalion of 50 tanks to a division at least, but it may be more—far more, up to five battalions to a division which is to undertake a decisive attack.”

His mind went back—and he smiled as it went—to the funny, earnest little instructor who had so loved playing with his little tank models on the table, covered with sand moulded to represent real country, and diversified with white tape for roads, little wood bricks for houses and green-dyed sponge for woods.

“ Look, comrades,”—he could hear the little man’s nasal tones even now—“ here in front are the Distant Action Group, the D.D. They go

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right through, right far, right fast—away over far beyond the enemy front. They make for his guns, his general, his reserves, his food, his water—they abolish them all.

“Here next—these, see, are the Further Support Group, the D.P.P. They have to shoot up and do away with all the anti-tank guns and machine-guns that they may find within a kilometre—two kilometres perhaps—of the front.

“And, last of all, the little working fellows, the N.P.P.—the Close Support Group—the runabouts that help the infantry do their heavy task.

“Now here is this—and this—and this—all three drawn up one behind the other—so—for the attack—when the word is given ‘Go,’ all together, off they go. Why all together? Because all together they must reach their aim, where they must go. And also why? Because not till they all have reached where they must go can the infantry—oh, the poor b . . . yes, the infantry—yes—start from their trenches to where they must go. And when they—the infantry, yes—they start, the N.P.P. they must be shooting up the enemy infantry in his front line, and if not, the infantry will not start. And the D.P.P., they must then be running round among the enemy machine-guns a kilometre ahead, and if they are not there, then our infantry also cannot start, for it is from there that much fire will come to stop them. And the D.D., they must then be right ahead of all, frightening the enemy’s general and making his reserves run away fast, and chasing his gunners

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to leave their guns and hide in holes, and setting fire to his food and upsetting his water. And if they are not yet there, then our infantry may start, but they will not get very far.

"N.P.P., comrades, here—no, yes, here—these that need not go fast or far—these are little tanks. And these—here—the D.P.P., these must go faster and farther—these are the middle, not too heavy, not too slow, but not heaviest or fastest tanks. And these here—these of the N.D.D., these, the fastest, the largest, the most strong and thick-skinned—yes.

"Please, comrades, to remember and not forget—time, punctuality as to programme, so exactly it must be. No waste of time, no delay for any need, no slackness, no neglect, or all will go astray. Time, comrades, please. . . ."

Tambovski woke with a start. The train was crawling into a station. Magnetogorsk! He put his head out of the window and caught sight of the station clock. An hour and a half late! His own watch, of course, had long since stopped.

(iv) *Italy, Japan, the United States*

So much for the tank doctrines of the three principal military Powers of Europe. We need consider only briefly the theories of the other three great world Powers, because, in general, they differ little from one or other of those already described.

For the Italians, the tanks' main duty is to open the way for the infantry, acting all the time

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in close liaison with it, and this they are expected to do by dashing ahead at full speed as soon as the attack starts and going right ahead to the objective. They surge forward in successive, following waves, the last of which will be only some 200 yards ahead of the leading infantry. It will be seen that this method of employment differs little from that laid down for the French tanks. The Italians expect, too, in any future war to be able to make great use of their motorised divisions and their fast divisions, both of which include a considerable proportion of tanks, and it is on these that they rely to carry out any independent missions of the kind foreseen in our own and the German tank doctrines.

The Japanese tanks too are first and foremost infantry weapons, though occasionally they may be called upon to cut loose on their own for some special but strictly limited purpose. Normally they are expected to act much as the French accompanying tanks, sweeping the ground just ahead of the infantry, and so making their way forward into and through the enemy positions step by step. One rule laid down in the Japanese text-books in itself affords proof of the high military spirit of their Tank Corps. "Even," it runs in effect, "if one tank only remains in action, that tank must continue the attack. Even if a tank's weapons can no longer be served, the tank itself must still keep on advancing and try to run down the enemy. Even if the tank is brought to a standstill, the crew must dismount their weapons

and continue the attack on foot." That is the spirit which wins battles.

The United States doctrine too differs but little from the French. Their tanks' principal rôle will, it is expected, be "to lead and escort other troops in a deep and expeditious penetration of the hostile position with a minimum number of casualties among the escorted troops" and only "under appropriate and unusual conditions" will the use of tanks or of "an armoured force consisting largely of tanks, independent of other types of troops, be justified." The accompanying rôle of tanks is regarded as necessary and highly important for the infantry, though this rôle need not inevitably involve a "bald-headed" frontal attack, and it is only of late years that the possibilities of armoured forces acting on their own have been seriously discussed and studied. American opinion still mainly considers that tanks are only an auxiliary arm, that can effect nothing of value save in close co-operation with others, and that these at need can, and may often have to, dispense with their help in battle. "It may be difficult to imagine modern war without tanks," writes one American officer, "but it is impossible to imagine it without infantry and artillery."

Summing up briefly the whole question of modern tank doctrine, it may be said that it is based almost entirely on what was done, or projected, during the Great War. The tank is now, as it was then, regarded in the main as an auxiliary offensive arm, to be used for the purpose

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of making it easier for the other arms to carry out their task of attacking and defeating the enemy. Most armies of to-day plan to employ it in the closest possible conjunction with these other arms, that is to say, in the way in which it was used at Cambrai, in the second battle of the Marne, at Amiens, and in all the later battles of the autumn of 1918. Artillery and engineers prepare the way for the advance of tanks ; the tanks cleave a road through the enemy defences for the infantry to follow up and make good the ground gained. Only in the later stages of the battle, when these defences have been breached and shattered, may the tanks be used for deeper thrusts, to exploit and enlarge the victory won and keep the enemy on the move ; and even then they must be followed up by motorised infantry or cavalry to consolidate and complete their success. All this is but the adaptation and extension of what was done, or attempted, in the Great War. The rôle of tanks, the purposes for which they are to be used, remain the same. The powers of the tank, the quality of the weapon, have been greatly improved. One would suppose, therefore, that the prospects of victory, and its results, should be increased in proportion to the improvement in the weapon. The results achieved by the primitive and imperfect tanks of the Great War, as we have seen, were great and in many battles decisive. How much greater then may we not expect the results achieved by our up-to-date, modern, highly efficient tanks to be !

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British and German ideas as to the use of tanks are even more ambitious. According to these theories, tanks are now expected to be able to take over the leading rôle in the offensive battle, and have become the principal arm of the assailant. The hammer blow of the powerful armoured brigades or divisions is to be utilised either in a swift and sudden frontal attack so as to rupture and dislocate the whole of the hostile array as far back in depth as its headquarters and reserves, or else in an encircling movement round the enemy's open flank into their rear, to isolate and demoralise their forward troops by destroying all support and control behind them. Such action is based on the British "Plan 1919" modernised and adopted for future use. But inasmuch as this plan remained a mere project and was never translated into action, most armies agree in being somewhat sceptical as to its possibilities, and prefer to confine themselves to what has been tested and proved in the actual crucible of war. In a word, they tend to keep their feet on the ground rather than their heads in the air.

But does it necessarily follow that because the first wartime tanks were able to do great things, our later and better tanks will be able to do things yet greater—or even as great? Before we can answer that question in the affirmative, we must consider the conditions under which these new tanks will probably have to work in any future war. War is not a proportion sum in mechanics, but a problem of the inter-action of contending forces.

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Before we can form an opinion of what the tank of to-day or to-morrow can do, we must try to forecast what resistance it will have to overcome. The future of tanks is largely conditioned by the future of anti-tank defence, to which we must now devote our attention.

CHAPTER XIV

ANTI-TANK DEFENCE

DURING the Great War, as will be remembered, the German High Command under-estimated the powers and potentialities of the tank so seriously that by the time the full extent of its menace was realised, it was too late either to build tanks for the German Army, or to provide the necessary special weapons for defence against it. That will certainly never happen again; indeed, every army in the world is now providing itself, not only with tanks or some other species of armoured fighting vehicle, but also with special weapons to repel tank attacks.

As a preliminary to forming an opinion on the future of the tank, therefore, it is necessary to review briefly the present conditions and possible development of anti-tank defence, and then try to strike some sort of balance between tank and anti-tank.

Generally speaking, defence against tanks may be carried out in two ways. Their advance may be blocked, or prevented, by the use or construction of obstacles which they cannot cross or upset—that is the first method. Alternatively, they may be met and destroyed by anti-tank weapons. Normally, of course, anti-tank defence measures

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in any particular case will consist of a combination of both methods. Obstacles will be used as far as they exist or can be erected; where this is not possible, anti-tank weapons will be employed to hold off or destroy the tanks with their fire.

Let us consider first the use of obstacles. Despite the power of the tank to cross country, there exist in any normal area of ground many obstacles which impede or entirely baffle it. The most important of these is the continuous water line of a river or a canal. A force ensconced behind such a line, with all the bridges over it destroyed or firmly held, is secure from attack by tanks unless and until the assailants can either capture an existing crossing or erect a temporary bridge strong enough to take these heavy vehicles. Either process takes time, gives the defenders warning of the hostile plan, and enables them to make effective preparations to meet and defeat it.

Other natural obstacles to tank attack are marshy or swampy country in which the machines may sink or become bogged; woods with trees too sturdy for the tanks to charge and knock down, and too closely grown for them to weave their way through; and banks too steep or slippery for them to climb. Very hilly or mountainous country is also impossible for tanks, save along the valleys or passes, and if tanks try to use these, they are in continual danger of being held up by some obstacle in a place where they can neither move round it nor retire and may be exposed to hostile fire from the high ground above. Open rolling plains offer the best battlefield for these

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vehicles ; it must be remembered that on the continent of Europe, where the hedges and banks and ditches so familiar to us in England are uncommon, there are to be found many such areas. Indeed, most of the great battles of European history have been fought on them ; it is rare for military operations of any importance to take place amid tangled mountains, in the heart of dense forests, in treacherous swamps, or in thickly enclosed country.

To these natural obstacles, however, it is usually possible for the defenders, if they have the time and the tools, to add artificial ones. These may be of many kinds. Barricades of felled tree-trunks or metal rails may be erected. Wide and deep trenches, with the sides nearest the defenders very steep or perpendicular so as to be difficult or impossible for the tanks to scale them, may be dug as traps. Rows of low tree-stumps, a foot or two high, will often catch tanks between the tracks and "belly" them, so that the tracks, both being raised off the ground, revolve uselessly in mid-air and the tank is stuck. Low pillars of concrete have the same effect if time, material and labour for constructing and placing them are available. In low-lying country, irrigated by canals, a water obstacle, the best kind of all as we have seen, or a swamp, can sometimes be artificially created by opening locks and inundating the land.

The most easily made and most effective type of artificial obstacle is, however, the minefield. The object of the mines in this field is not

necessarily to blow up and destroy the tank, but to break its track. This track, it will be remembered, consists of a continuous line of plates, the smashing of one or more of which will put the whole track out of action and bring the tank to a standstill ; then, of course, it is not only useless to its own side, but an admirable target for hostile anti-tank weapons. Quite a small and light mine suffices to break a track plate ; but a large quantity of such mines is needed if they are to be sown closely enough to catch anything that tries to pass over them, and extra work will be required if they have to be buried, as they should be if they are to come as an effective surprise to the assailants. Fully to cover the four miles of front which a division in defence would normally expect to have to occupy, would need 100 tons of 10-lb. mines—thirty heavy lorry-loads—and these can be lightly buried by 250 men in about two hours' work. If it is desired to make the minefields really formidable, however, several successive lines will have to be laid, for the shells of the guns firing to cover the tanks' advance will probably detonate or damage a certain number of mines and form gaps through which they can pass—if they can find and follow them. This, of course, requires more mines, more transport, more labour, and more time, which may not always be available. We may, however, take it as certain that as means of anti-tank defence mines are most effective and will be used as much as possible.

Most important of all, however, are anti-tank

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weapons designed to stop, damage, or destroy tanks by fire. On the existence of these, it may be remembered, depends much of the value even of anti-tank obstacles. There are few obstacles that tanks, given time and freedom from molestation, cannot either get across or go round. Even rivers or canals can be bridged; it takes time, but if tanks can eventually be got across and the defence has no weapons of any avail against them, the only sensible use it can make of that time is to run away. The real use of obstacles is that they stop or slow up tanks at short range from enemy weapons, which then have every chance of hitting them and damaging them or knocking them out. Only in this way can a tank attack be not only held off, but beaten off.

The only effective weapon for this purpose that the Germans had in the Great War was their field gun, which was not designed or well adapted for such work. Modern field guns have been re-designed and re-modelled so as to make it possible for them to fire faster, to fire with a flatter trajectory (that is, the projectile takes a course close to and almost parallel with the ground, so as not to rise too high to hit a tank), and to swing about more quickly to fire in any direction necessary. All these improvements have made them far better anti-tank weapons than their predecessors of 1914-1918, so that it may be said that artillery is well able to protect itself against tank attack, at least on its direct front.

The task of protecting the defending infantry, however, is no longer the artillery's job. The

infantry have their own weapons in the shape of special anti-tank guns, so that they can defend themselves. Every army has them, many of them, and many varieties of them, and it is not proposed to describe here in detail—even in as much detail as we devoted to the latest models of tanks—their specifications or the powers claimed for them. But a general description must be attempted.

These weapons may be divided into three categories. First comes the machine-gun category; weapons that fire heavy armour-piercing bullets, such as the British Boys, the French Hotchkiss, the United States Browning, and the Italian Fiat models. These machine-guns are usually of about $\frac{1}{2}$ -inch calibre, and their projectiles can, it is claimed, penetrate half an inch of armour at 500 yards. They can fire up to 450 rounds a minute.

Second, comes what may be called the one-man gun category. These are weapons capable of being fired by one man, usually from a ground rest, but their projectiles are not heavy bullets which go through the tank armour and may, or may not, hit a member of its crew or some important part of its mechanism inside, but small shells which, upon penetrating the tank, burst inside it and are almost certain to do considerable, if not always fatal, damage. There are guns of this category in use in all modern armies, the most favoured calibres being $\frac{4}{5}$ -inch (20 mm.), such as the Swiss Oerlikon and the Danish Madsen, or 1-inch (25 mm.), such as the French Hotchkiss and the British Vickers. The action is automatic—that

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is, the recoil resulting from the discharge of the gun, which would normally tend to throw it back out of position, is taken up and compensated for by a spring or buffer machinery, so that the piece is not displaced after every shot but remains stationary and ready for firing again as soon as loaded. This, of course, helps speed and accuracy of shooting, and the $\frac{4}{5}$ -inch gun can fire 300 rounds a minute and the 1-inch gun a 180 rounds a minute. The thickness of armour penetration claimed for both guns is about $1-1\frac{1}{8}$ inches (30 mm.) at 500 yards range.

Third and last comes the category of larger guns, the action of which is not fully automatic, and which usually require a team of several men to handle them and have to be carried or towed behind some sort of special cross-country vehicle. The German PAK and the Swedish Bofors are typical makes of this category. Ranging in calibre from $1\frac{1}{2}$ inches (37 mm.) to close on 2 inches (47 mm.), they fire a larger and heavier shell, but of course have a slower rate of discharge ; their range too is longer, but their powers of armour penetration ($1-1\frac{1}{8}$ to $1\frac{1}{2}$ inches at 500 yards) not as much superior to those of the smaller calibre guns as might be expected.

All armies now possess considerable numbers of these three categories of anti-tank weapons in varying proportions. Infantry units are usually armed with anti-tank machine-guns only ; the heavier weapons of the gun type are organised as separate units under the higher control of brigades or divisions. The number of guns per

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division varies greatly, from thirty odd in the case of the Italian and French armies to seventy-two in the case of the German army. These enemies of the tank have thus grown numerous and powerful. The penetrative powers of all these weapons are enough to get through the armour, not only of all types of light tank now in use, but also of that of most types of medium tank too. But it must be remembered that the figures given above are for hits that strike the armour plate full, that is at an angle of 90 degrees; if, as will more often than not be the case in battle, the blow is a slanting one, say at a 60-degrees angle, the power of penetration will be much reduced, by anything from a fifth to a quarter of the figures given, while shots that strike at a greater angle will probably, many of them, not penetrate at all, but ricochet off and burst harmlessly outside the tank.

Lastly comes the tank itself. Most light tanks now carry an anti-tank machine-gun, and a well-aimed stream of bullets from this gun will certainly incommode, and may well incapacitate, an enemy vehicle even of a larger and more powerful type. Medium and heavy tanks all carry a gun designed for use against other tanks, firing an armour-piercing shell that penetrates and bursts inside, long-ranging, powerful, and efficient. Such heavier machines as exist to-day, or may be built during the course of a future war, will have even more powerful guns for use against their armoured foes. Duels, not only of isolated tanks against each other, but of small groups of

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tanks, will be a feature of such a war ; indeed, there will probably take place land fleet battles on an even larger scale, in which such will be the potentialities of the contestants for mutual destruction, that a few minutes of intensive shooting and high-speed manœuvre may well lead to the crippling or decimation of both sides if their skill and armament be more or less measurable, or to the annihilation of the inferior if they be even slightly unequal. For in the modern mechanised warfare, neither side can hope to purchase victory with any but the best weapons, handled with the utmost technical and tactical skill, so that they may give of their best. Good men in good tanks will drive the less good from the field, and the best men in the best tanks will win the tank battles of the future.

But winning the tank battle will not necessarily mean winning the campaign, for such engagements, like the cavalry duels of the past, are but means to an end—the defeat of the enemy's main army in a general battle. The side inferior in tanks will not, of course, seek a tank battle at all, nor necessarily will the stronger do so, for he may not care to incur the inevitably high losses it will involve. And in any case, as admirals have long since found, seeking is not always finding, and there are many ways in which an inferior fleet, whether of ships or tanks, may elude or refuse battle.

These, then, are the modern tank's foes :—The obstacle, the weapon, the tank. These, if it is to play anything like the important part it

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played twenty years ago, it must be able to contend with and overcome. How far can it do so ? What is the balance to-day, what will be the balance to-morrow, as between tank and anti-tank ?

CHAPTER XV

TANK AND ANTI-TANK

IN order to arrive at a considered view as to the balance of power as between tank attack and anti-tank defence, let us imagine a debate between two advocates, briefed, the one to uphold, the other to confute the proposition :

“ That the anti-tank defence now has the measure of tank attack.”

Mr. X speaks first, thus :

“ My case, ladies and gentlemen, has been recently put in a nutshell by an American writer¹ in these words : ‘ Anti-tank has the edge over the tank.’

“ My case is based on the following facts :

“ The events of the late Great War, on which my learned friend, Mr. Y, will no doubt seek to establish his theory of the great power of the tank—amounting, indeed, if we are to believe him, to little short of invincibility—have, I maintain, little bearing on the present position. The art of anti-tank defence has now reached a far higher degree of perfection. Its importance is fully appreciated everywhere ; it will never again

¹ Capt. J. I. Greene in the United States, *Infantry Journal*, May-June, 1938.

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be neglected or left to be extemporised in a makeshift and haphazard manner, as it was by the Germans twenty years ago. It is true that tanks, too, have improved ; it is my contention that they have not improved—I go farther, are not likely in the future to improve—as fast or as far as the means that will be used to combat them.

“ I will assume the case of one enemy, Red, ready for a tank attack by a Blue enemy army in a chosen position in normal country, where tanks can operate with reasonable freedom. I assume that the Red army has a normal, reasonable equipment of anti-tank weapons, say for each division 13,000 mines and 50 guns or machine-guns which can take on a tank. These weapons are all of the most modern type. The Blue army, I also assume, will have the necessary number and types of tanks to carry out an attack on the scale and in the manner now accepted as orthodox. I say that such an attack will almost certainly fail, and that at a high cost in tank casualties.”

The Chairman : “ Very interesting. There are other cases, as you no doubt realise ? ”

Mr. X : “ Yes but I am taking a typical case. First of all, certain areas of every battlefield will be unsuitable for tank operations at all by reason of natural obstacles. The Red commander will have selected his position largely, if not primarily, with a view to taking full advantage of these. In other words, certain parts of his position cannot be and will not be attacked by tanks.

“ These ‘ forbidden areas ’—forbidden, that is,

from the tank point of view—will be further increased by artificial obstacles, in so far as the time and the means at the Red commander's disposal permits. The means, I have assumed, he will have ; the time required is but small—a matter of a few hours, twelve at most, for putting out all the available anti-tank mines in front of the position, and digging tank trenches and so forth, so as to block the most likely routes of attack for tanks.

“The increase of the attacker's ‘forbidden areas’ and the consequent narrowing down of the defender's danger areas, will enable the Red commander to concentrate the greater proportion of his anti-tank guns and machine guns on the rest of his front. A few, of course, he will be wise to leave to watch the ‘forbidden areas,’ for even the most formidable natural obstacles may sometimes be overcome or circumvented if left unguarded. Others must be detailed to guard the artificial obstacles, not only to prevent their removal, but also to take full advantage of the good opportunities that will be offered to destroy tanks as they slow up trying to pass them. Yet others will have to be kept in reserve to meet any unforeseen emergency. But the bulk of the weapons—in normal circumstances, I estimate, two-thirds of them—that is to say, 30 to 35 guns per division, will be available for defence. That would give 35 weapons to every 3,500 yards of front, or a weapon to every 100 yards in the ‘danger areas.’”

The Chairman: “All this is somewhat theoretical and vague, Mr. X. In actual practice

there will surely be many exceptions to what you are pleased to call the normal case."

Mr. X: "I agree that there will be exceptions, but not, I think, as many as to invalidate my general thesis.

"To proceed, then. On such a front one might expect, perhaps, an attack by anything between 50 and 150 tanks, moving some at speeds of 5 miles an hour, others at 10, others at 15 miles an hour."

The Chairman: "But it has been put in evidence and proved that tanks can now cross country at anything from 10 to 30 miles an hour. Why do you reckon only with speeds of from 5 to 15?"

Mr. X: "Because the tank has to pick its way under fire in constant fear and peril of mines, traps, and obstacles, and cannot—or at any rate, will not—go all out. Moreover, great speed always means great unsteadiness—much pitching, rolling and bumping. At high speeds, therefore, the tank crews cannot use their guns effectively; the tanks must slow down to enable them to do so.

"It is my contention that, under normal conditions, the anti-tank weapons should be able to get off enough rounds to account for at least 40 tanks if moving at 15 miles an hour, for 50 if moving at 10 miles an hour, and for 120 if moving at 5 miles an hour."

The Chairman: "That seems to destroy your own case, Mr. X, as you were reckoning on having to deal with 150 tanks in all."

Mr. X: "If you will pardon me. My further

contention is that most of the attacking tanks will be running at the slower rather than at the faster speeds ; that if the fire of the anti-tank weapons be held back till a tank comes within its most effective range—500 yards and under—it will have a good target and be able to fire for a minute at least—perhaps for several minutes—before the crew of the tank can spot it and start to reply to it ; that in such a duel the chances are all in favour of the anti-tank weapon knocking out the tank before it can be knocked out itself. In nearly every case its projectiles will be able to penetrate the tank's armour, whereas it will itself be entrenched and its firer protected by a shield. Moreover, the tank fire, delivered from a moving platform, will be effective at short range only—not much above 200 yards—and between 200 and 500 yards the fire of the anti-tank weapon will be by far the more accurate. Such fire can usually be opened at these longer ranges because even the smallest tanks are conspicuous targets, and so noisy that it is difficult, nay, impossible, for them to steal up to the defence unheard. I do not think that my conclusion that every well-sited and well-served anti-tank gun ought to be able to account for from one to three tanks, according to the speed at which they attack, is over optimistic."

The Chairman : " And what about the survivors ? I mean the surviving tanks, for on your figures there will be no survivors among your anti-tank gunners."

Mr. X : " Even if they still push on and are

not deterred by the sight of the heavy casualties among their comrades they will have to run the gauntlet of the reserve anti-tank guns, which will, by the time they have forced their way past the first line of anti-tank weapons, be warned and ready to receive them warmly. They will also have to face the artillery, which still have—and even to an increased degree—the value as an anti-tank arm that they had in the Great War ; and the defender's tanks, which will be at hand to counter-attack them in superior numbers and with all the advantages of freshness and unimpaired strength and their own chosen ground to fight on. I believe that those attacking machines that may break through the front line of anti-tank defence will be too few to be able to do much harm, and that none will ever get back again."

The Chairman : " What about surprise ? "

Mr. X : " As I have said, such noisy vehicles as tanks will never find surprise easy to achieve, even if only one or a few are moving. When a mass of them is concerned you would hardly credit the din they create ; it must be heard to be believed. It is far more likely that the anti-tank weapon, lying well hidden, will be able to surprise its noisy adversary by opening fire at short range, or that tanks may come unexpectedly on an obstacle or a minefield."

The Chairman : " Very well, Mr. X. Mr. Y will no doubt have something to say on the point. Proceed, please."

Mr. X : " I do not know that I have much more to say on the question of the duel between

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tanks and anti-tank weapons as such. It will almost invariably, I contend, end in favour of the anti-tank defence. But as I foresee that my learned friend will argue his case, in part at least, on a somewhat different basis, I will try to anticipate his contentions. He will tell you that tanks will never again attack without the full support and close co-operation of other arms ; that smoke will blind the defenders ; that gas will cause them to wear hampering masks ; that barrages of shells will blast most of them out of existence ; and that the survivors will be dealt with by air bombing or machine-gunning, so that almost all the tanks and the infantry, who will advance close beside or behind them, will have to do is to clear up what is left. I merely wish to suggest, in reply to this, two things, and I have done.

“ First, all these arms are of equal use to the defender as to the attacker. He, too, has artillery that can put down a barrage in front of his lines ; smoke, which in any case will be of doubtful help to the advancing tanks, can be used by him to puzzle and blind them ; gas is a double-edged weapon so long as tanks themselves are not proof against it ; and the aeroplane has great potentialities as an anti-tank weapon, of which in future more will certainly be made. Secondly, all these weapons, employed together time and time again in the Great War, did not avail to bring decisive victory to the attacker. Enough machine-guns and enough defenders to man them always survived to prevent a break through. It will, in my view, be the same to-morrow. As has been

stated in the new *French Regulations for Field Service*, 'To-day the tank finds itself confronted by the anti-tank gun just as the infantry of 1914-1918 found itself confronted by the machine-gun.' To-morrow, as then, the attacker can win only if he has something approaching the same superiority, and is prepared to face the same enormous losses, in men and in machines too, as the price of victory."

The Chairman: "Is that all, Mr. X?"

Mr. X: "Yes, if it please you, that is my case."

The Chairman: "Thank you, Mr. X."

"Mr. Y, will you kindly state the case against the proposition Mr. X has just upheld?"

Mr. Y: "Ladies and gentlemen of the jury, I am ready freely to admit that tanks can no longer expect to be able to operate without formidable opposition, both from special anti-tank weapons and from hostile tanks as happened in the Great War. I am further ready to agree with my learned friend that the task of overcoming such opposition will certainly be difficult, may well on occasion be too difficult, and is bound in either case to be costly in tank casualties. But when he goes on to say that the duel between tanks and anti-tank weapons will almost invariably end in the latter's favour and produces a whole fantasia of so-called facts and purely theoretical figures to prove it, I disagree alike with his evidence and with his conclusions."

"I do not know where he got these figures; presumably from the results of peacetime range practices and field firing. . . ."

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The Chairman : " Is that so, Mr. X ? Would you kindly inform us ? "

Mr. X : " Yes, that is so. Every effort is made to render these practices as realistic as possible—the tank targets are full size, they are arranged to move as attacking tanks would. . . . "

Mr. Y : " But, if I may interrupt my learned friend, they do not, I think, fire real bullets ? "

The Chairman : " Mr. X ? "

Mr. X : " No, of course not. Realism carried to that extent would hardly be possible. "

Mr. Y : " Exactly so—as I thought. Therefore the results quoted by you are no more realistic than those of a cricket batsman making strokes at a non-existent ball. They may be faultlessly made, but they form a highly unreliable guide to the number of runs he is likely to make in a match. A great deduction must be made from the figures of range practices to get even an approximation to battle firing results. How great, it is impossible for me to attempt to say accurately. But some idea may be had from the enormous differences between the results of naval firing in war and in peace—in the last war hits on enemy vessels in action amounted to one in fifty shots only, instead of one in four on targets at peacetime battle practice. Fully this deduction must be made from the figures with which my learned friend has bombarded and bewildered us—I should say even more, for the conditions for the anti-tank gunner in battle will be far more confusing and nerve-shattering and difficult than for the controllers of naval gun fire. These

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latter are normally working with accurate instruments in comparative security from enemy fire. The anti-tank gunner will be subjected, almost up to the moment when the tank closes with him, to the drum-fire of enemy guns, the blinding effect of enemy smoke, the discomfort and handicap of enemy gas, showers of bombs from enemy airmen and bullets from the enemy machine-guns and rifles, even before he has to face the lead-spitting, charging tank. If you, ladies and gentlemen, will endeavour for a moment to imagine yourselves in his place, you will be able to form your own opinions as to how remote my learned friend's optimistic figures of anti-tank achievement will certainly be from reality. War was once described to me, humorously, but with much truth, I believe, as consisting for the most part of a process of two sides flinging tons of metal at each other and almost invariably missing. A man can be wounded or killed by a single sliver of lead or steel, yet it took many tons of metal in the last war to cause each casualty. Nothing but a direct hit by a shell will put a tank out of action. Getting that direct hit on a comparatively small, comparatively fast-moving object under battlefield conditions will be no easy matter. It can, of course, be done, and it will often be done; but nothing like so often, in my firm conviction, as my learned friend would have us believe.

"But my learned friend, I must further point out, has been talking all the time of the most unfavourable case for the tank attack. He has assumed for the defending commander plenty of

time to select his position and prepare for attack, and an accurate knowledge of where and when that attack is coming. Will he always enjoy these advantages? My learned friend, if I may be permitted to say so, answered the Chairman's question about the possibility of surprise in a somewhat misleading manner. The Chairman, I take it, had in mind the possibility, not of one or more tanks sneaking up Red-Indian-wise and surprising an anti-tank gunner, but of using a mass of tanks in a sudden surprise attack."

The Chairman: "You are quite right, Mr. Y. That was, of course, what I had in mind."

Mr. X: "May I intervene? My point still, I think, holds good that the noise of a tank advance, whether by one, few or many machines, will always militate against surprise. The more machines, the greater the noise."

Mr. Y: "There are ways and means of overcoming even that difficulty, considerable though I am ready to admit it may well be found. It is possible to keep up constant tank noises for a long time on end. How will the defender know when the moment of danger has come? Even if it should not be found possible, as it was in the War, to blanket or smother tank noise, it can still be simulated and made in two, three, or more places at once. The attacker can often use what he cannot conceal in order to deceive."

The Chairman: "I take, Mr. Y, your point to be that tanks, despite their noisiness, can still be made use of to seize or create an opportunity for surprising—not perhaps individual enemy

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tank gunners, who are their immediate foes, but the enemy commander who is responsible for disposing these gunners to repel the tank attack, and so nullifying or disorganising his dispositions ? ”

Mr. Y : “ Precisely. I do not say that this will invariably happen when tank meets anti-tank, or can always be done. I do not even say it will frequently happen, or be easy to do. I say that the tank gives the attacking commander the chance and the power to outwit and overwhelm his adversary as no other military weapon of the present day does, or any military weapon of the future seems likely to do. A tank force can manœuvre fast and strike hard and go on striking. It is not all-powerful ; it is no longer as powerful as in the Great War ; but it is the most powerful weapon in the assailant’s armoury. It is also, like most powerful weapons, highly fragile. It cannot and must not be used anyhow ; but used with art and cunning and resolution, it will bring victory to the attacker, or to the defender.”

The Chairman : “ Or to the defender, did you say ? What do you mean, Mr. Y ? ”

Mr. Y : “ Yes—or to the defender. In my opinion, the tank is an even more powerful weapon in his hands than in those of the attacker. The former can win his battle only by delivering a counter-stroke, well known and proved by history to be the most difficult and delicate operation in war. If he merely confines himself to holding off the enemy attack, his success may be important, encouraging to his own army,

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costly and depressing to that of the enemy. But how much better if he can fall on that enemy, disordered by an unsuccessful, or a partly successful, attack and turn the confusion of repulse or half-victory into sudden and utter defeat !

“ A tank force is the best possible weapon for this purpose too. It can be ordered up to the right place at the right moment more quickly, arrive there more speedily, and get into action faster and with greater effect than any arm yet known in war. It may meet enemy tanks ; it will almost certainly find them with tired crews, reduced in numbers by losses, short of petrol and ammunition, possibly disorganised after their attack, or engaged in rallying or refitting. The attacking infantry will possibly be separated from their tanks, and whether they have just arrived on the defensive position or have been held up in front of it, are unlikely to have their anti-tank weapons fully ready to deal with a counter-attack. In my view, such a counter-attack has far greater prospects of success than an offensive by the tanks of the attacking side against a defensive position well organised for anti-tank purposes. The chances of winning in the latter case will usually be a good deal more favourable than my learned friend is prepared to admit. In the former case they may well be highly favourable. Given a reasonable equality of numbers, armament, and skill on either side, that which best knows how to use its tank force will win. But the defender needs such equality the less, or, if you prefer to

put it another way, can achieve more with it if he has it, than his adversary."

The Chairman : " Is that all you have to say, Mr. Y ? "

Mr. Y : " All save my peroration. My case is that tanks, though they may no longer be the ace of trumps in the hand of a general—pray excuse the metaphor—are still a trump card. He may not be able to win a decisive victory with them ; he will certainly not be able to win one without them. Used to their fullest potentiality, in close conjunction with all other arms that can help them, or that they can help, they are still the most powerful weapon at the disposal of the attacking side, and an even more powerful one in the hand of the defence. That is my case."

The Chairman : " Thank you, Mr. Y. Well, ladies and gentlemen of the jury, you have had both sides of the argument put to you. Will you now consider your verdict ? "

CHAPTER XVI

LIGHT FROM RECENT WARS

BEFORE proceeding to final conclusions on the future of tanks in war, it is necessary to consider such light as may be thrown on the matter by the recent wars in Abyssinia, China and Spain.

In the first campaign much of the country, especially in the northern theatre, was almost impossible for the light Italian machines to move over at all, being for the most part roadless and trackless, with deep-cut, boulder-strewn valleys and steeply precipitous mountain peaks and ridges. Tanks could be used only as escorts to road convoys, in which duty their presence usually served to deter rather than to repel attack—a real, but unspectacular service. In the southern theatre, on the other hand, they were engaged, in small numbers but with good success, in many of the raids carried on by Marshal Graziani's mechanised columns. Unfortunately, few details of their work, or, indeed, of these particular operations as a whole, have ever been published. Such lessons as may be drawn from the events of this war are therefore inconclusive and hardly novel. The Abyssinians had no anti-tank defence of any kind, apart from primitive traps in which one or two machines were caught, but their

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rugged mountains and deserts were sufficiently effective substitutes for it. All that need be said, therefore, of the lessons of this campaign is that in warfare in semi-civilised or barbarous lands, tanks will be more hampered by the country than by the enemy.

Even less is known about the many campaigns which for the past fifteen years the Japanese have been carrying on in China, and we have no details at all of the part played by tanks, though there appears, in the light of such reports as we have, to have been considerable tank activity. As regards lessons for the future, therefore, the Far Eastern campaigns enlighten us not at all.

About the Civil War in Spain, however, we know considerably more. Both sides have used tanks. The Insurgents have an early pattern of German light tank, a fast, light, two-man machine, thinly armoured, with small cross-country capacity, carrying one or two machine-guns; and Italian Fiat-Ansaldo—an even smaller type and less powerful, similarly armed, manned and armoured. The Government armies too have a light, two-man tank, and also a larger and heavier medium tank, both of Russian pattern, which, though slower, carry thicker armour than their rivals, and a light gun as well as a machine-gun. When, as has occasionally happened, tank versus tank battles have taken place, the Russian machines have almost invariably swept their rivals from the field.

In action against other arms in the general battle, however, neither the Insurgent nor the Government machines have come up to expecta-

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tions. The popular impression that General Franco has owed his victories mainly to the greater quantity of foreign material sent him, as compared with that at the disposal of the Government, is certainly not true as regards tanks. Both his German- and Italian-built machines have developed serious defects. Their armour is far too light to afford the crews any protection against anti-tank gun fire, and high speed—though it has often enabled them to avoid damage and destruction—results in such violent oscillation as to prevent any effective shooting while on the move, and often causes vehicles to crash headlong into trenches or traps, besides proving a heavy strain on crews and mechanism. In fact, the earlier Insurgent tanks, tactically and mechanically, proved failures, though in the War much useful if unspectacular work has been done. Nor have the Government machines come up to expectations. They have shown great slowness and clumsiness; their rubber tracks have often been destroyed by anti-tank shells, or set on fire by petrol or dynamite bombs thrown in close combat by Insurgent infantry, whom faulty design, or lack of close support by their co-operating infantry, has allowed to dash or creep up to close range.

In the contest between the tank and the anti-tank gun, the balance in Spain is at the moment definitely on the side of the latter. The anti-tank guns of both armies have shown themselves highly effective. The best results seem to have been given by the medium calibre guns of 20 mm. and 25-mm. calibre. The smaller pieces, firing

armour-piercing bullets only, instead of shells designed to penetrate and burst inside the tank, could not be relied on to stop advancing machines, while the greater weight of shell of the heavier models was more than counter-balanced by the faster rate of fire of the medium types. Where these anti-tank guns were thick enough on the ground, they invariably not only took heavy toll of attacking tanks, but beat them off; only where there were too few of them, either because of an actual shortage of guns or because of losses caused by the hostile artillery bombardment before the start of the tank attack, could this attack manage to get home. Both sides' experience, in fact, has been summed up as follows:

"Whenever a tank attack has met with strong, well-handled anti-tank defences, it has been annihilated or immobilised and has failed to accomplish its task. Where such defences are lacking, or are no longer intact, the tank attack has gone home with an almost mathematical certainty."¹

If any success at all was to be achieved, tanks, it is generally agreed, had to be used in mass, and their attack preceded by an artillery bombardment with the object of damaging or disrupting the anti-tank defence. The light tank is shown to be a reconnaissance rather than a fighting machine, and has to be supported in action by medium and, if possible, by heavy tanks too. For tanks to get too far ahead of their supporting arms, or to try to play an independent mission,

¹ Klotz, *Les Lecons Militaires de la Guerre Civile en Espagne*, p. 83.

always proved dangerous and never successful; even on the rare occasions when deep penetration into the enemy lines was effected, the machines suffered serious or annihilating losses while rallying or trying to get home.

But we must beware of assuming that these lessons, suggestive and valuable for the future as they are, can be blindly or strictly applied, or will always be valid for any future war. The numbers of tanks on either side were small—perhaps 350 per side at most—fewer than were used at the battle of Cambrai in 1917—so that any sort of massed tank attack, in the accepted meaning of the term, was out of the question. Apart from the matter of numbers, the use of the tanks available—lights acting without the support of mediums, attempts not only to force open but to keep open a breach in the enemy line without the necessary means to do so, lack of co-operative support from other arms—contravenes in many respects not only our present-day tank doctrines, but even the lessons of the Great War. Finally, the complete inexperience and lack of training of the tank personnel on both sides must be taken into account. To teach a recruit to handle and fire an anti-tank gun is a matter of weeks; to teach him even the elements of managing and fighting a tank is one of months, if not of years, before any approach to complete competence can be expected. The leadership of such a highly flexible and mobile formation as a modern tank force, too, demands the highest physical and mental qualities, and more practice and experience

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than can have been possible for any commander on either side in the Civil War to possess. The action of the petty and inefficient little bodies of tanks in Spain is not to be compared with that within the powers of a powerfully armed, high-speed, and flexible fighting organism, such as our modern Tank Brigade. The Spanish Civil War is more informative as to the limitations of tanks than as to their powers, but up to the point beyond which it would be unwise to press them, its lessons tend generally to confirm those of the Great War and our present-day views of tank functions.

CHAPTER XVII

THE CONCLUSION OF THE WHOLE MATTER

IN the preceding chapters an attempt has been made to state as objectively as possible the data on which must be founded any opinion worth formulating as to the future of tanks in war. In the last chapter I propose to abandon this impersonal note for a purely personal statement of my own opinion in the matter. I shall do so the more readily because one of the most common errors, or impertinences, of our time, is our habit of clothing our personal views and prejudices in the guise of the voice of England, or the voice of God, or something equally awe-inspiring. The expression of opinion that follows is mine and, for all I know, mine only—"an ill-favoured thing, but mine own," as Touchstone said of his Audrey.

Here then are my conclusions on the whole matter :

(1) Though the progress made since the Great War in the design and construction of tanks has been great, progress in the means of anti-tank defence has been greater still.

(2) In consequence, the tank is no longer to-day, nor is it likely to be in the future, a weapon which, wherever used, will automatically bring victory to its users. It will have to fight anti-tank weapons

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on more or less equal terms—perhaps with the odds, if anything, against it, since in an even contest the chances are usually in favour of the defence.

(3) Nevertheless, the tank has by no means lost its value as a weapon of war. It is the most powerful weapon in the hands of the attack yet invented. In the hands of the defence it is equally potent, if not more so. So long as any one great army in the world goes on building tanks, all its possible foes will certainly have to follow suit.

(4) Our own army, which has fought on an average throughout its history three wars against uncivilised foes for every one against a European enemy, can least of all afford to dispense with a weapon to which, however an undeveloped theatre of war may hamper its activities, no non-European army is likely to possess any effective counter.

(5) Our own army also, which has always found soldiers hard to obtain, but has the enormous material resources of the richest Empire in the world behind it, has every reason for replacing men by machinery as far as possible. Such a policy, whether in peace or in war, is the cheapest and the most effective we can adopt. We should therefore build more, and not fewer, tanks, and not abandon what is still the most powerful of all military machines because it is no longer so powerful as it was twenty years ago.

These, then, are my conclusions on the whole matter. A few remarks in elaboration of the various points, and I must leave it to my readers to agree or disagree with them as they please.

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The first two conclusions—the progress made since the War in anti-tank defence, and the consequent diminution of the tank's dominance at that time—have already been adequately discussed, and no more need be said about them here. They will, I think, be generally admitted as proved. Some objection may be taken to the statement that in an even fight the chances are on the side of the defence, for it is a well-known maxim of war that only by means of the offensive can decisive victory in war be won. But it must be remembered that only the side that possesses some considerable element of superiority over its adversary is in a position to assume the offensive with any prospect of success. In anything approaching an even contest the defence should always prevail.

The third part requires more elaboration. It is a military truism to say that to every weapon of war there is a counter ; but to deduce from this axiom that the weapon thus countered has lost all its value and must incontinently be relegated to the scrap-heap is neither valid in logic nor true in practice. For the policy of true wisdom is surely so to use the weapon as to minimise or nullify the effects of its counter-weapon and to get the best value out of its powers and potentialities, while at the same time using every effort to increase these last. History, as well as common sense, indicates to us the correctness of this course. No naval power has ever contemplated abandoning armoured warships because they cannot be made proof against all

projectiles at all ranges ; naval designers do what can be done in this respect consistent with the rival demands of speed and gun-power, and leave it to the admirals to make good use of the tools with which they have been provided. That is, indeed, the whole art of the leader: to make the best out of the tools he has. Infantrymen are still generally regarded as the main strength of armies, though the most vulnerable of all to hostile fire, and so far from anyone seriously proposing to abolish them, every army in the world is trying to increase their numbers.

If armies decide to abandon the tank as a principal weapon of attack, with what weapon are they to replace it ? With what are they to try to do its work ? Cavalry are slower, more vulnerable, and little less conspicuous as a target. Infantry alone can no longer carry an attack through to swift and decisive success. Both these facts the events of the Great War clearly proved, and the post-war developments have confirmed and increased, rather than diminished, this impotence. Admittedly a combination of all arms in the offensive alone can lead to victory, but it is surely wise to entrust the main rôle in the offensive to an arm which has proved its capacity in recent war, rather than to those which have proved their incapacity. No army, then, unless it is prepared to forswear for ever all intention of attacking its foes in war, can afford not to build tanks for offensive purposes ; and so long as tanks are being built by their possible enemies, even nations whose war policy is defensive only

will have to follow suit, just as no great navy in the world but must build battleships so long as battleships are being built anywhere. For the tank is the tank's worst foe, and only by tanks—more tanks, more powerful tanks, better-handled and better-led tanks—can an army possessing a strong tank fleet be encountered and defeated.

The fourth point may be similarly dealt with. The fact that there are large stretches of the earth's surface where no present-day tank, and no tank ever likely to be built, can possibly operate, is no reason why we, in our Imperial campaigns, should not make the fullest use of tanks whenever and wherever it is in any way possible. Tanks cannot move and fight everywhere, but we have every inducement to employ them against uncivilised or semi-civilised enemies, because they will in such campaigns possess all the dominance in battle that they enjoyed in the Great War, and will have to overcome only the difficulties of the ground, rather than the resistance of the foe. The military strength of civilised against uncivilised man has always lain in his superior armament, and if he loses or yields that superiority, away goes his power. We cannot afford in our small Imperial wars to dispense with so formidable a weapon as the tank unless it is sheerly and absolutely impossible for us to use it. It would pay us to keep a large force of tanks, even if all other European armies were to abandon them. It would pay us to do so, even if we never fought in Europe again.

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The fifth and last point requires a little more elucidation. For an industrial nation, we have always been curiously reluctant to replace men by machines for military purposes ; indeed, it has usually required the urgent pressure of war to induce us to modernise our army. Even to-day, any proposal, say, to arm our infantry with machine-guns which have as great a fire-power as a much greater number of rifles is greeted with vehement protests, as if it were an insult alike to intelligence and to virtue to suggest saving men by making the fullest possible use of improved weapons. Yet surely, from the business point of view alone, it is wise to explore and exploit all such possibilities to the utmost. Let us therefore briefly examine the comparative monetary cost of infantry and tank units.

It has been calculated that though to convert an infantry battalion into a tank battalion would cost a considerable capital sum, the extra cost would be more than recovered in a year by the great reduction in pay of personnel and other maintenance costs. And every year thenceforward the saving of costs would continue, amounting in the case of a United States Tank Battalion to £400,000 a year.¹

For this reduced expenditure, be it noted, the country gets in fire power more than one and a third times as much from the tank as from the infantry unit ; or, if the number of fighting men in the two units be reckoned, the fire power of

¹ These figures are taken from the American work, *The Fighting Tanks since 1916*, by Jones, Rarey and Icks.

the tank soldier is nearly eight times as great as that of his infantry comrade.

Financially economical as it is in peace, the tank is still more so in war. It is probably a conservative estimate even to-day to assume that ten tanks can do the fighting work of two hundred and fifty ordinary soldiers, that is to say, then, ten tanks can capture a position that in their absence would cost two hundred and fifty casualties. In the Great War the United States Government insured the life of every one of its soldiers for £2,000, and the cost of training and feeding and clothing him while in the army came to an additional £500. A casualty list of two hundred and fifty of these expensive soldiers would thus cost £625,000, whereas the total loss of all the tanks would cost but £50,000. From the purely mercenary point of view, that is a large economy.

To me personally, however, that point of view is only of secondary importance. To regard such a matter merely as one of pounds, shillings and pence is worthy only of the nation of shopkeepers which our detractors have so often declared us to be, and too uncomfortably reminiscent of Falstaff's reply to Prince Hal's complaint about his "pitiful rascals" of raw recruits :

"Tut, tut ! Good enough to toss : food for powder, food for powder ; they'll fill a pit as well as better ; tush, man, mortal men, mortal men."

I prefer to believe that the true wealth of a realm lies in its sons and daughters, and that not merely true economy but mere humanity demands

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that if they are to be called on to face toil and suffering and death in their country's cause, the least that country can do for them is to see that they go out to fight armed with the best weapons that money can buy or genius devise. Axiomatic, even platitudinous, as such a principle may seem, it is one which our history tells us has, to our shame, too often been forgotten or flouted.

What the face of a future great war may have to show us no man can accurately foretell. It has been said that the path of an army in a battle of to-morrow seems likely to be marked by "a long trail of scrap iron." Better, I may perhaps make so bold as to remark, a trail of scrap iron than heaps of human corpses. Better still if the trail of scrap iron lead forward to victory and peace, whereas the piled dead have all too often been the signs of failure and defeat.

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